Products Finishing

CLEANING
PLATING
POLISHING
FINISHING

DECEMBER 1951

Saving Nickel

Lea Copper-Glo

Something New in Bright High Speed Copper Plating

The Ronal Bright Copper Process* using Lea Copper-Glo is the answer to the platers' prayers because it answers the problem of extreme nickel shortages.

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The Ronal Bright Copper Process using Lea Copper-Glo can be fitted into your plant operating cycle. Regular cyanide or Rochelle Copper baths can be readily converted to obtain these advantages. Write for further information.

**Ronal Bright Copper Process is a development of Ronal Chemicals, Brooklyn, New York, for which process patents are pending.*

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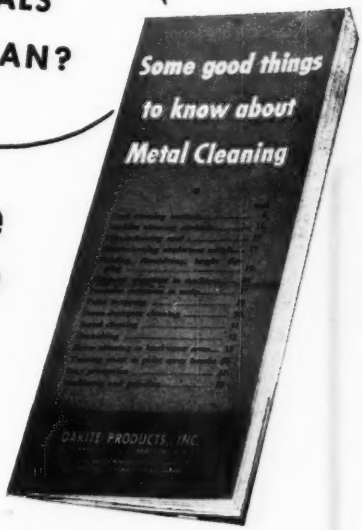

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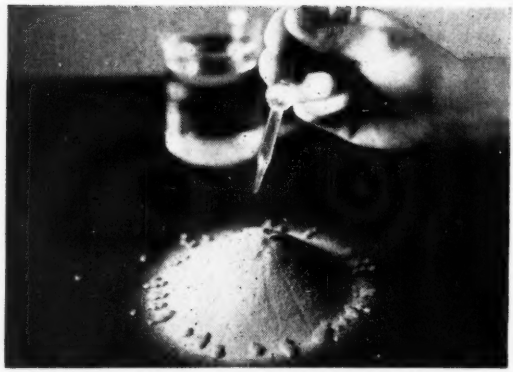

LOW CAPILLARITY is shown by the way this abrasive grain sheds water. It will repel glue in the same degree, resulting in insecure adhesion of abrasive to wheel head — and short wheel life.

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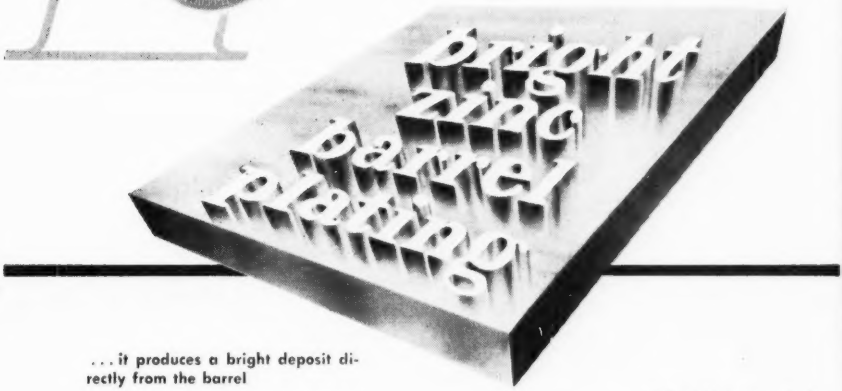

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Products Finishing

DECEMBER 1951
VOLUME 16 • NUMBER 3

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Economical

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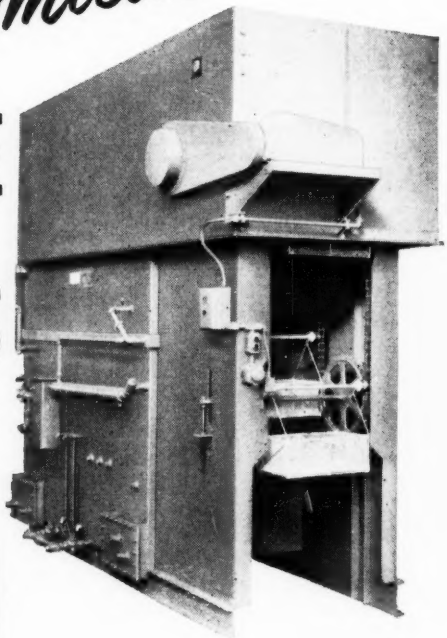

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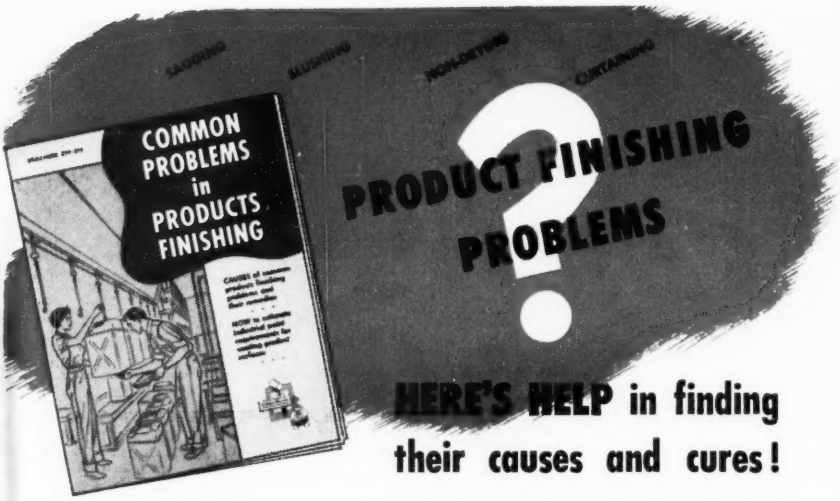

HERE'S HELP in finding their causes and cures!

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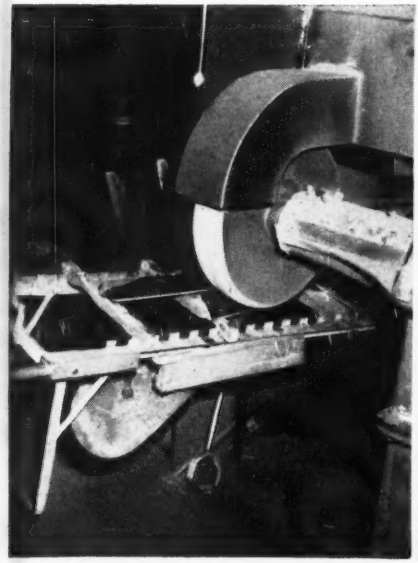

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ALOXITE TP—tough, blocky grain with maximum efficiency for high stock removal. Recommended for polishing steel and other metals of high tensile strength.

ALOXITE TPC—medium sharp, tough grain. A general purpose grain well suited to polishing where small amount of metal removal is desirable.

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A letter from the Editor

DECEMBER, 1951

Dear Reader,

This greeting comes to you over a considerable distance—some 7,000 miles—from Japan, where your editor is currently serving with the U. S. Air Force.

Through the kind assistance of Dr. Sakae Tajima, Professor of Electrochemistry at Tokyo Metropolitan University, as well as the cooperation of several manufacturing plants, I have been able to make a brief survey of the Japanese finishing industry. Generally, it can be said that the Japanese electroplaters and paint finishers are beset by problems of shortage and substitution much worse than those of the American finishers.

However, the Japanese finishers, like the Japanese people generally, persevere and do not let their problems keep them from celebrating the holidays they enjoy so thoroughly. Christmas is not celebrated by many Japanese, since only about 100,000 of them are Christians. New Year's Day is their important festival during this season.

In America, however, this is the time of year when the feeling of brotherhood, the word of cheer, the greeting, the gift, and the kindly act serve as outward manifestations of the "Spirit of Christmas." Both the season and the "Spirit" should emphasize the fact that there is a fundamental unselfishness and goodness that lies in the hearts of many people, regardless of nationality.

And so, on behalf of the entire PRODUCTS FINISHING organization, I send you sincere good wishes for Christmas, and express the hope that the Christmas Spirit may bring about a better understanding between individuals and between nations.

Ezra A. Blount

—EDITOR

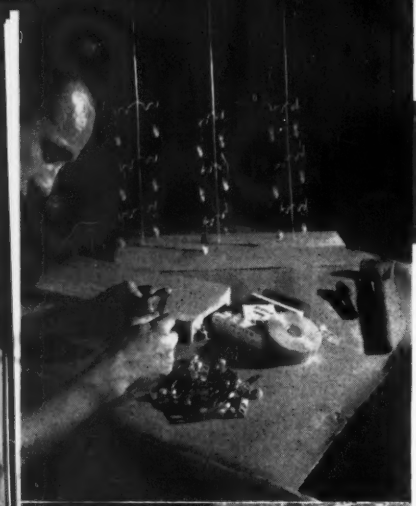
Finishing Prec

By GILBERT C. CLOSE

DUE to the multiplicity of products produced, the critical nature of each, and the necessity of maintaining tolerance standards seldom encountered in industry, the products finishing department at AiResearch Manufacturing Company, Los Angeles, is faced with many peculiar problems. A major problem in conjunction with many products is application of a thoroughly effective protective coating without in any way altering the shape, size, weight and balance of the part.

In general, AiResearch is engaged in the production of air and heat control equipment for high speed and high altitude aircraft. In practice, however, these products resolve into hundreds of specific designs with the production of each design limited to the relatively few airplanes of each type. To illustrate, some 75 basic heat exchanger designs, including air-oil coolers, fuel-oil coolers, intercoolers, and so on, are being produced today.

A brief description of but one of these hundreds of products will give a vivid insight into the finishing problems involved. This product is a small air expansion turbine, no larger than



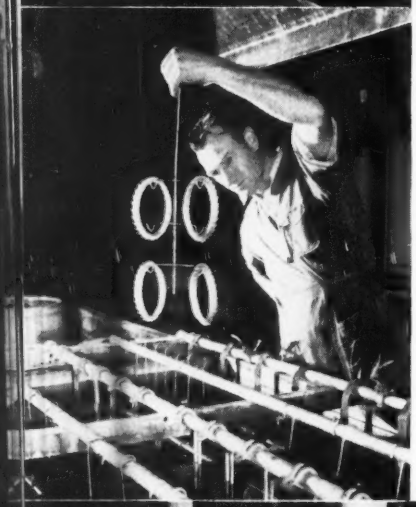


Fig. 1 — (top) Masking electrical contact points prior to plating.

Fig. 2—(center) Inspecting precision machined steel rings during cadmium plating.

Fig. 3—(left) Nitric acid passivating tank (left) and pickling tank (right). Small but efficient is the keyword for all equipment in the finishing departments.

a man's hand, that operates at 100,000 r.p.m. Cooling capacity of this midget is equal to that of 35 average household refrigerators. It can convert 600 deg. F. air into a chilling blast that will cause moisture to condense into snow. The turbine is used to cool the cockpit of high-speed jet fighter airplanes. Its failure would cause the cockpit to become untenable within a matter of seconds. The turbine is made of aluminum and installed on airplanes that will operate both at sea and on land, thus subjecting it to the most severe corrosive influences. It need not be emphasized that finishing operations (cleaning, surface treating, and painting) on products like this demand a special degree of care and the best in modern, efficient equipment. Failure of the product, resulting from defective finishing that would permit natural deterioration, might cause the loss of a million dollar airplane with all lives aboard.

To cope with this situation, and with the necessity of maintaining the inbuilt precision of the parts handled, the finishing departments at AiResearch operate on a highly personalized basis. Mass finishing in the general sense is not attempted. Strong processing solutions that will materially affect the surface finish or dimensions of a part are seldom used. As most components enter the departments in small batches, the equipment (vats, tanks, booths, oven, and so on) is scaled down in size without detracting from its efficiency. In fact, the relatively small size of the equipment components permits more personal attention from the operator, a highly relevant factor in light of the critical results required.

All solutions are under strict laboratory control, are checked periodically, and are maintained in rigid conformance with the applicable Army-Navy Specification. Physical factors such as temperature of the bath, time in the bath, and current density, are controlled just as closely as chemical concentrations. The employees in all finishing departments are thoroughly orientated in the fact that these preliminary controls are vital to precision finishing regardless of subsequent effort.

Many of the parts reaching the finishing departments are of a degree of tolerance 30 times finer than used in the best wrist watches. Profiled turbine impellers maintain tolerances within 0.0001 inch. Electronically balanced components will often have vibrational and torsional tolerances equivalent to five-millionths of an inch. On the other hand, housing and body components are far less critical and can be handled by conventional methods.

This divergency of tolerance requirements often makes it practical to use different solutions for the same job. Descaling operations come under this category. A mixture of hydrochloric and chromic acid in solution is used for descaling parts of non-critical dimensions; precision parts are descaled in a less violent phosphoric acid solution.

Most parts are routed directly from the machine shop to the finishing departments. In some cases, high precision parts such as turbine impellers are electronically balanced after surface treatment. During balancing, it may be necessary to shave a bit of metal from some portion of the part. These parts are then returned to the finishing department for a touch-up job.

Fig. 4—Masking a motor rotor cover with masking tape prior to plating. Delicate masking operations are a major activity throughout the AiResearch product finishing shops.

Most turbine impellers are made of aluminum and anodized. When a touch-up job is necessary, a simple chromic acid (approx. 10 per cent) swabbing solution is used. The Dow No. 7 dichromate proceses is used for the initial treatment of all magnesium parts. Touch-up is accomplished with the same solution when possible, but when part components (bushings, bearings, inserts,) have been added after the initial treatment, an ordinary chrome pickle solution is used for touch-up work if the parts added would be harmed by the hydrofluoric content of the dichromate solution.

A process termed "steam annealing" is used in surface treating the high silicon steel laminating stock used in fabricating small control motor rotors and armatures. In this process, the thin sheets are first immersed in a hydrofluoric acid bath, then placed in a steam chamber and blasted with hot steam. Temperatures up to 1200 deg. F. are used. The treatment results in a hard black coating that does not interfere with the electrical properties of the metal, and offers a high degree of protection against corrosion.

Because of the large number of electrical contact surfaces, hydraulic connection faying surfaces, joining surfaces, threaded connections, and so on, found on the parts reaching the finishing department, masking to protect these surfaces during treatment is a complex and highly important operation. Nine trained women are engaged full-time in various types of masking work. Some of the masking operations on the small, critical assemblies and parts require the same delicate touch used in working on a fine watch.

Ordinary masking tape is used for easily accessible larger areas. Masking paint is employed on areas that can be conveniently reached by a brush. High and low melting point waxes are used either to mask off areas, or to coat the entire part and then be removed from areas to be plated. In some cases parts are wholly plated, then masked as desired and the plating stripped from areas where it is not wanted. Due to precision, weight and balance requirements, each new product usually presents new masking problems.

To protect the finishes applied, each part is given a coating of protective oil before it leaves the finishing departments. This oil, conforming to Army-Navy Specification AN-VV-C-576, is composed of one part rust preventive and three parts high grade aviation mineral oil. This coating effectively inhibits corrosive influences during bin storage, or during subsequent shipment of the part.

At AiResearch, the finishing department also tests and seals castings that will subsequently serve under conditions of hydraulic or air pressure. The sodium silicate casting sealing process

is used. Facilities are available for sealing such castings internally or externally, according to subsequent use, and sealant pressure is generated by both the vacuum and external pressure methods.

Zinc chromate primer is used exclusively as a base coat on products finished with paint. In most cases application of the primer is entirely conventional, but a few parts require special work. The field windings in small motor housings and the somewhat porous rotor and field metals contain appreciable moisture when they enter the finishing department. It is necessary to remove this moisture and seal against its re-entrance before the parts enter final assembly. To accomplish this, the parts are pre-heated prior to the first prime coating. They are then sprayed with zinc chromate and passed immediately through an infra-red oven operating at approximately 300 deg. F. When the parts emerge from the oven, they are sprayed again before they cool and pass once more through the oven chamber. It has been found that this triple heating and two-coat priming schedule effectively removes all moisture and seals the part before more can enter.

Many of the turbines operate at elevated temperatures, and require a temperature-resistant external organic coating. Two paints are used for this purpose. One is a regular commercially available high temperature aluminum finish. The other is a glycerol pthalate coating material, first applied, then crinkle-finished in an oven. Ordinary commercially available finishes are used for parts that will operate at low temperatures.

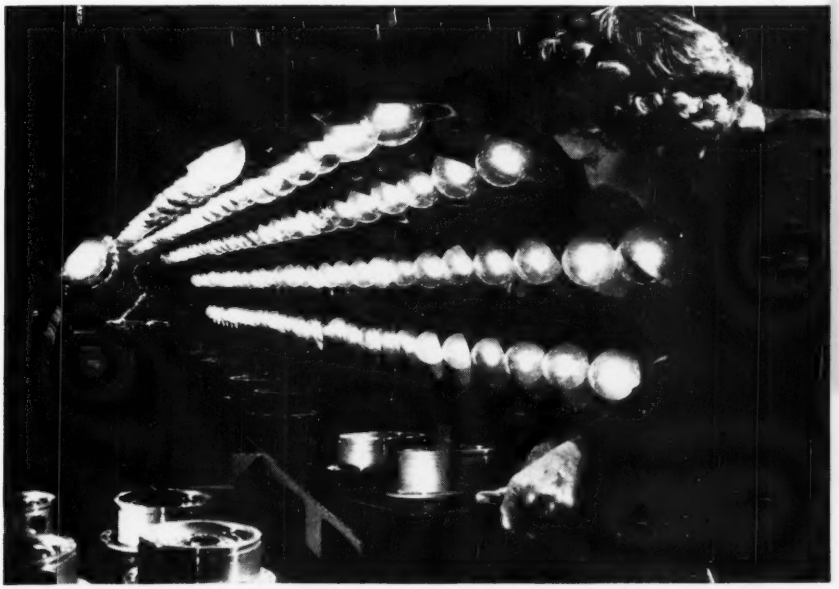


Fig. 5—Infra-red bank, 20 feet long, used for quick drying of organic finished parts. Turbine housings are shown on the conveyor. This oven is used also for drying motor field and armature windings prior to final prime coat application.

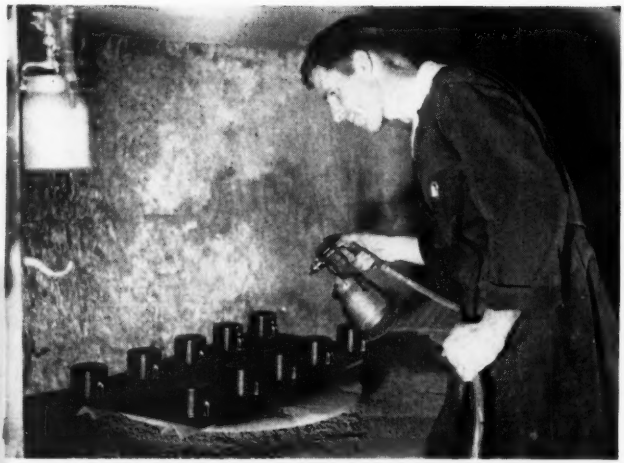
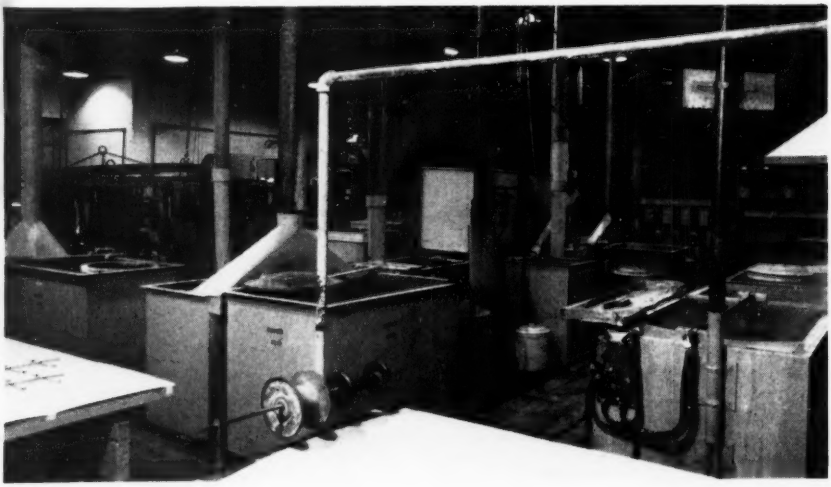


Fig. 6 — Personalized attention is given each part in the spray booths.

Of course, the high speed accurately balanced parts are not organically finished. It would be difficult to apply an organic coating with enough precision to maintain the delicate balance required. Surface treatments, usually of the oxidizing type, must be employed and applied in a manner to give ample protection throughout the life of the part.

Milmer No. 1, a Minnesota Mining and Manufacturing Company product, is mixed with paints used to coat organic materials such as plastic, micarta, and impregnated plywood. The purpose of this ingredient is to prevent fungus attack on the finished part. This treatment is particularly important on parts that will be exposed to warm and humid conditions, either climatically or due to their location in operation.

Fig. 7—After-hours' view of the plating and surface treating department, showing relatively small size of all equipment. Close, personal supervision of work is thus expedited.
(All photos courtesy AiResearch Mfg. Co., Los Angeles, Calif.)



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2. Faster, more uniform plating!
3. Even distribution of current!
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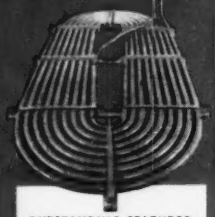

These coils provide the benefit of high heat transfer rates and physical strength of copper, coupled with the corrosion resistance of lead. They're made with the same processes used in manufacturing Electro-Cupralum Anodes. Copper tubing is homogeneously sealed in a dense structured lead covering. This special process assures perfect heat transfer between the copper inner tubing and the outside protective lead covering. Cupralum Coils are offered by Udylite in a range of diameters and types sufficient to meet virtually any need. Ask your Udylite Technical Man today about Cupralum Coils.

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PIONEER OF A BETTER WAY IN PLATING

The electroplating department at AiResearch is relatively conventional except for the complexity of the various masking operations on the many small, precision parts. Cadmium plating constitutes the bulk of the work. Some copper plating is accomplished. Hard chrome plating is not used. As the bulk of products produced are of aluminum or magnesium, less attention is given to plating work than to the various light metal surface treating processes. Furthermore, production plating to the narrow tolerances required by most AiResearch products would be a costly and rather difficult procedure.

In overall perspective, work accomplished in the various AiResearch finishing departments would not impress the casual observer as being far from the ordinary. But a close observer would soon note the difference. He would mark immediately the almost complete absence of strong working solutions that materially affect the dimensions of a part. He would note the detailed, almost personal attention accorded every operation. He would be impressed by the care used in masking and preparing each part for treatment, and by the almost tender care with which each precision part is handled.

Product finishing at AiResearch is nearly 100 per cent functional in respect to maintenance of the product in its manufactured condition and dimensions, and to minimize chances of failure brought about by corrosion, rot, fungi attack, rusting, and other natural deteriorating factors. Product appearance is a secondary factor. The importance of this aim is emphasized by the critical part each product plays in the safe operation of some airplane.

Operations in the finishing departments are tuned to this tremendous responsibility. The net result is precision product finishing reaching a quality level seldom attained in the course of ordinary industrial production.

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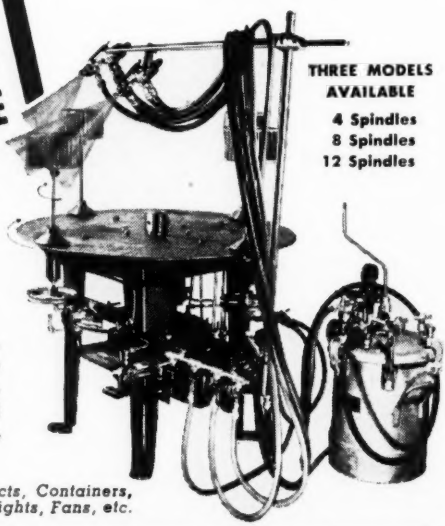

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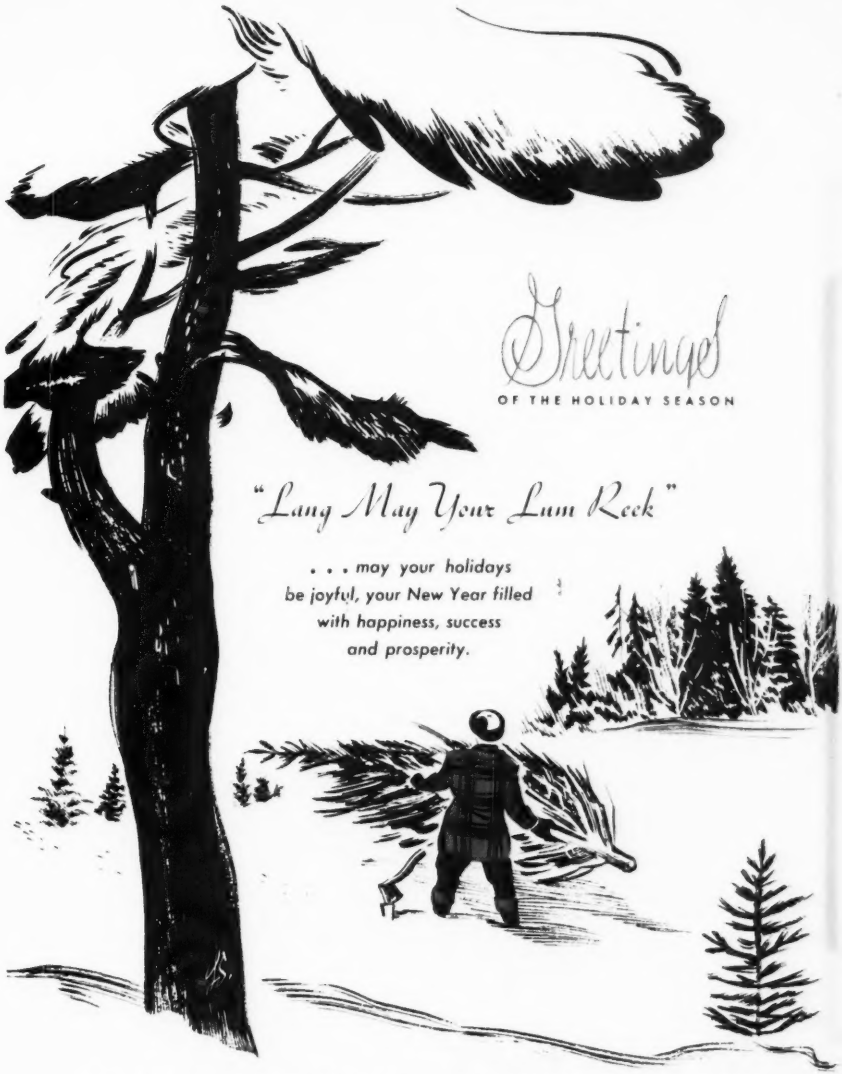

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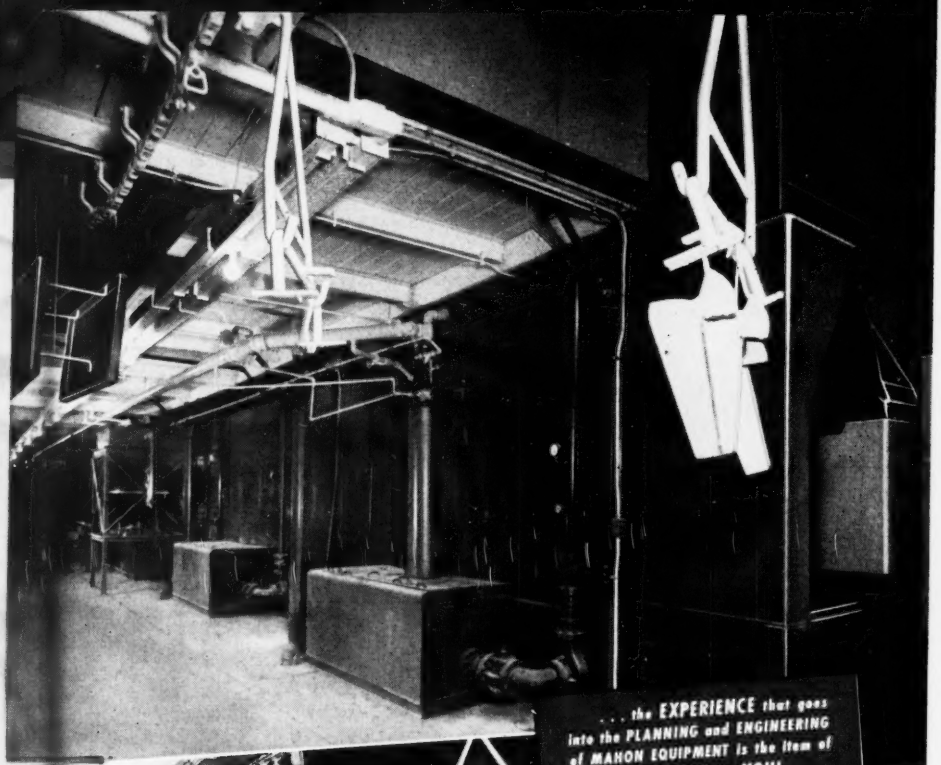

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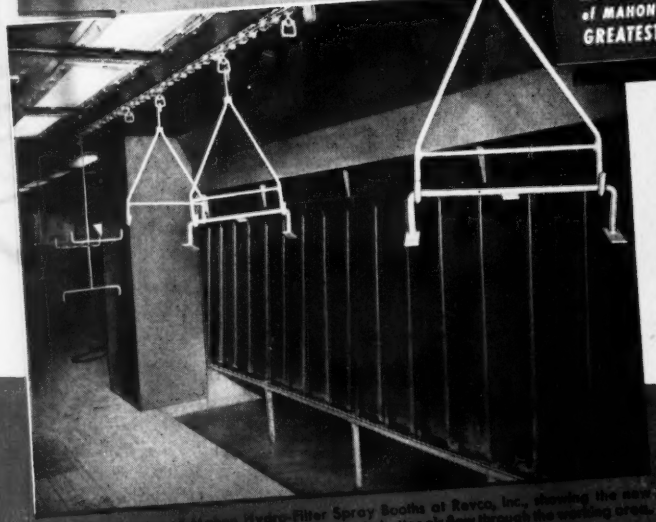

Interior of Mahon Hydro-Filter Spray Booths at Revco, Inc., showing the new "Hydrairo" Flood Sheets which provide better air flow through the working area.

Above: View of Mahon Metal cleaning and Rust Proofing Machine equipped with the new Mahon "Fire-Jet" Heating Units on the Solution Tanks. These Heating Units eliminate all heat exchangers, such as immersion fire tubes, and thereby simplify the maintenance problem. **At Right:** Home Freezer Cabinets and Component Parts passing through the Tack Rag Operation prior to entering the Spray Booths. Note completely finished parts emerging from overhead Finish Baking Oven.

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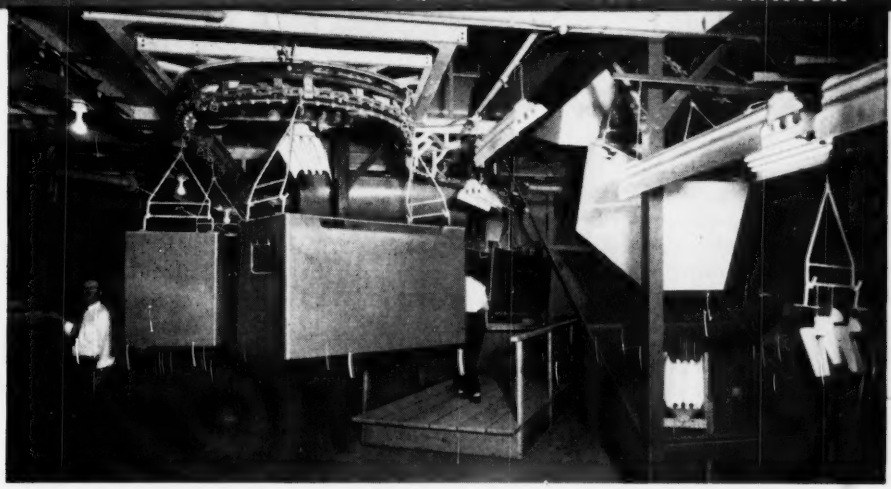

Modern Equipment at REVCO, Inc., REDUCES FINISHING COSTS . . . PRODUCES FINER FINISH!

Major units of the Complete Mahon Finishing System at Revco, Inc., Deerfield, Mich., are illustrated here. The System provides for continuous processing on a single conveyor line . . . it reduces costs to a minimum, and, through better control of each phase of the finishing process, it produces a finer finish. It is another typical example of cooperation on the part of Mahon engineers in planning a system complete in every detail, yet so compact that it occupies a minimum of floor space. Some of the novel features of the system are the "Fire-Jet" Heaters on processing solution tanks of the Cleaning and Rust Proofing Machine, and the new Mahon "Hydraire" Flood Sheets in the Spray Booths—these provide greatly improved working conditions. When you are in need of finishing equipment you can't do better than to rely on the recommendations of Mahon engineers. Because, Mahon engineers have pioneered development in this highly specialized field for over thirty years . . . they have accumulated a wealth of technical knowledge and practical know-how not available to you elsewhere. See Mahon's Insert in Sweet's Mechanical Industries File, or write for Catalog A-652.

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AHON

Quick Clear Dip Cuts Cost of Finishing Zinc Die Castings and Plated Parts

Greater corrosion resistance, better quality finish, and improved adhesion of organic coatings on zinc rank among outstanding advantages secured easily, at low cost, with simple chemical immersion techniques. A typical example with bath makeup, operating cycle and other data are given in this concise discussion.

By ARTHUR P. SCHULZE

QUALITY and economy top the list of vital considerations covering any basic finishing operation. But the succeessful realization of these two important objectives frequently proves to be something else agian. Zinc may be taken as a classic example.

Since the war period particularly, developments in materials and methods designed to increase corrosion resistance, step up finish quality, and improve paint and lacquer adhesion on products or parts fabricated from zinc and its alloys have attracted wide attention in the majority of those de-

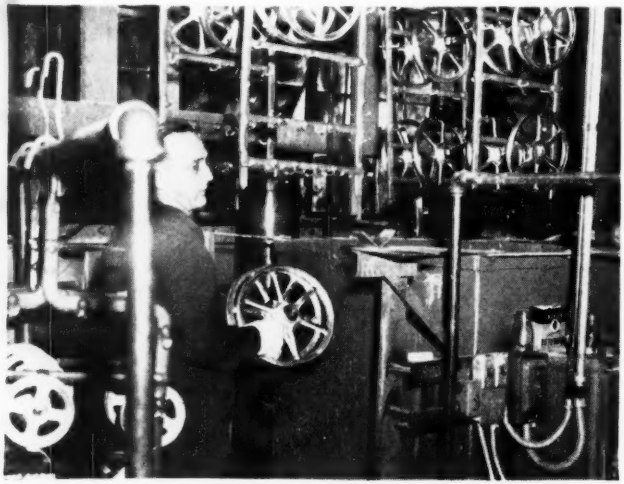


Fig. 1 — Pulleys are loaded and unloaded on to automatic plating and dipping machines.

partments, plants and shops called upon to handle this type of production finishing.

As a direct result, dip materials and methods for finishing zinc continue to draw considerable interest from finishing department superintendents and shop foremen. This is proving the case especially with those developments or improvements that offer opportunities to accomplish this vitally important dual objective.

Of these simplified dip coating techniques for zinc, many already have found wide usage as they have clearly established their value in eliminating the traditional shortcomings of zinc as a protective product finish. Application range of these treatments is widening steadily, for growing production experience merely serves to accentuate their quality improving, cost reducing advantages.

One such process, known as the "Unichrome Clear Dip" developed by United Chromium, Inc., New York, is in use at Congress Drives Div., Tann Corp., Detroit. Its successful applications presently include, among others, such items as screws, toys, ice skates, pulleys, wire goods, and gadgets.

Producing a low cost finish that actually brightens dull zinc to a sparkling luster which resembles chromium plate to a remarkable degree, the process is based on two steps: (1) zinc plating the work in a regular commercial bath; and (2) giving the work a quick finishing dip in a special solution made up with a proprietary chemical compound and water.

By means of this simple dip-coating cycle, a clear, bright protective "chemical conversion coating" is formed on the parts treated. Consisting of zinc oxide and zinc chromate, the finish provides qualities of eye-appeal comparable to chromium plate and excellent rust resistance.

Indicative of the excellent corrosion defiance provided by chromate conversion coatings of this type is the fact that the finish successfully withstands for a minimum period of 50 hours, the destructive effects of salt spray exposure without the formation of white corrosion. In other laboratory tests, conducted in conformance to U. S. Specification No. AA - QQ - S - 91, zinc plated parts coated with this clear dip withstood 20 per cent salt spray for periods ranging from 75 up to 125 hours before showing visible indication of white corrosion products.

Outdoor exposure tests have shown that the coating stands up more than nine months with but extremely slight surface dulling. Even in tests conducted in industrial atmospheres, the finish exhibited no white corrosion products;

ARTHUR P. SCHULZE, no stranger to the readers of PRODUCTS FINISHING, is a member of the Cleveland, Ohio staff of Hill & Knowlton, public relations counsel, and industrial writer.

Mr. Schulze attended the School of Journalism at the University of Missouri and became acquainted with the finishing field in 1938 when he became associated with Oakite Products, Inc., New York, N. Y. After his military service, he joined Taber Instrument Corp., North Tonawanda, N. Y., as publicity manager, and became a staff member of Hill & Knowlton in 1947.

whereas other specimens, zinc plated only and given no additional protective treatment, had become dark gray and mottled in appearance over a nine-month period.

Protection of product in shipment, on display, and in use, economy of application, and the provision of a good base for tenacious adhesion of subsequent paint, lacquer or enamel coatings are still other benefits now being gained in many plants through the use of this improved, simplified process.

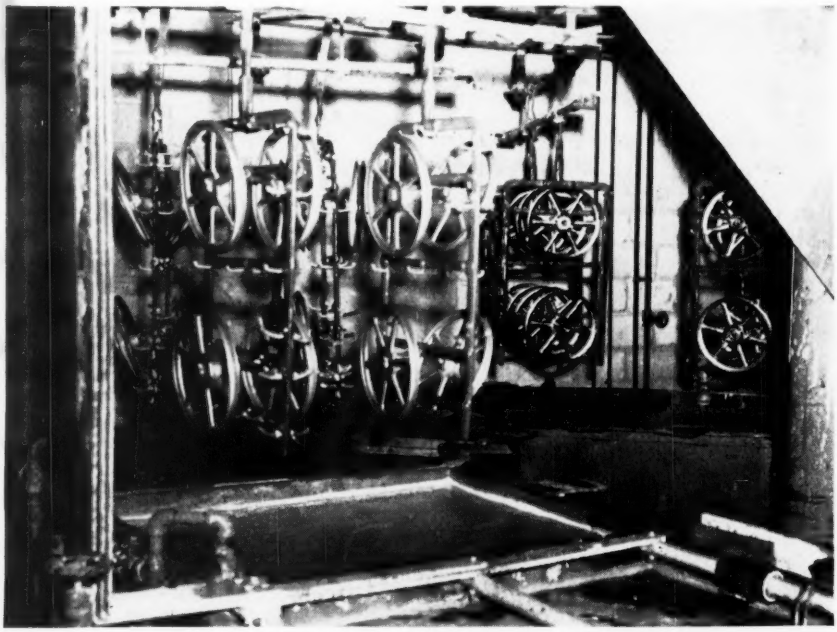
From any of the zinc baths in everyday shop use, it is possible to obtain an eminently satisfactory bright finish, with the clear dip bringing up the desired luster. For organic finishing, no other "surface conditioning" is required. That is because this finishing treatment provides a base surface which assures excellent film grippage and prevents coating failures incident to zinc corrosion, thereby avoiding the time and trouble often incurred with an extra priming coat.

Surface Preparation and Plating

Degree of corrosion resistance obtained and brightness of the final finish produced by this chemical dip method depend considerably upon the condition of the surface finish prior to processing. Minimum thickness of zinc plate recommended is 0.0002-inch, with optimum results calling for 0.0003 to 0.0005-inch.

After the usual preplating preparation, including electrocleaning in a suitable alkaline solution, followed by

Fig. 2—Pulleys have come up out of electric cleaner tank (foreground), transferred over, and are ready to be immersed in cold rinse. From here the action is repeated into cold rinses and acid etches till the work gets to the zinc plating tank, where a horizontal timed conveyor carries the parts on to the vertical transfer conveyor, as shown in Fig. 4, for the clear dip and leach.



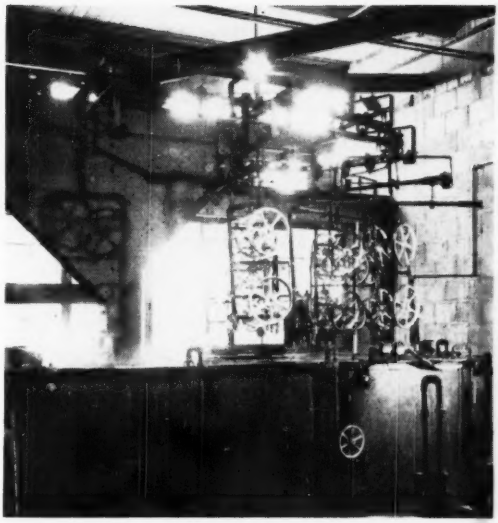


Fig. 3 — Congress Drives' pulleys ready to go into clear dip tank.

thorough rinsing and acid dipping, work is zinc plated using any bath in present day zinc plating practice. For example, one typical bath composition and operating procedure giving excellent results in many plants are the following:

Zinc Cyanide ..... 8 oz./gal.
Sodium Cyanide.. 5.6 oz./gal.
Caustic Soda .....10.4 oz./gal.
Temperature .....85 deg. F.
Current Density, 15 to 25 a.s.f.

Chromate dips may be used on unplated work as well when corrosion resistance constitutes the principal surface treatment requirement and appearance of the finished product forms a secondary consideration; for example, unplated zinc parts used in the interior of machinery and equipment, or work that is to be painted, lacquered, or enameled. The conversion coating formed provides an excellent base for firmly adherent organic coatings. In these instances, the work is prepared exactly the same as for electroplating, but is finished instead by the dip method subsequently described.

Composition and Equipment

To make up a dip finishing bath using Unichrome Dip Compound 95, 12½ gallons (144 lb.) of the dip compound are required for each 100 gallons of solution. The resultant solution contains 172 gm./l. or 23 oz./gal. of the compound. This composition, on a volume basis, is approximately equivalent to 7 parts water to 1 part dip compound, making 8 gallons of solution.

In preparing the solution, the dip tank is filled about two-thirds full of water, the chemical compound is added in the required amount and the mixture thoroughly agitated. Following adjustment of solution level with water, reagitation and warming to operating temperature, the solution is ready for production line operation.

The process also requires the use of a leaching solution, which is made up with sodium carbonate (soda ash) and which must be replaced periodically. Composition of the leaching solution is as follows:

1. For maximum corrosion resistance—
   gm./liter 15
   oz./gal. 2.0
2. For maximum brightness—
   gm./liter 60
   oz./gal. 8.0

Corrosion resistance and brightness of varied combinations are secured by using solution concentrations between these limits.

To prepare this leaching solution, the tank is filled two-thirds full of water, and the required amount of sodium carbonate added, a little at a time, while stirring. Solution is diluted to operating level, then stirred well.

An acid-proof container should be used to hold the clear dip solution. For this purpose, ceramic-lined steel tanks, stainless steel (18-8) tanks, plastic-lined tanks, glass tanks, or ceramic

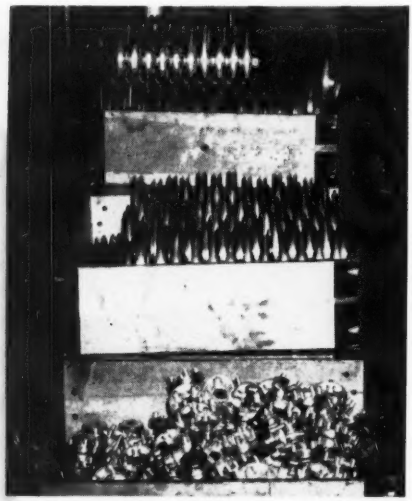


Fig. 4—Bright finished parts handled in bulk from automatic machine without danger of scratching or marring.
(Photos courtesy Congress Drives Div., Tann Corp., Detroit, Mich.)

crocks are recommended. Leaching solution can be prepared and contained in an unlined steel or any other type tank suitable for dilute alkaline solutions. It should be equipped with an ordinary steel heating coil.

Racks or wires are used to hold large work (pulleys, for example) during processing, while baskets or other suitable equipment is suggested for handling such bulk work as screws. Generally speaking, barrels are not recommended for processing bulk work due to the short immersion time.

All handling equipment should be covered, of course, with a good rack coating or other suitable organic coating. Ceramic or hard rubber baskets are also suitable. Work should not be dipped while touching a different metal since experience in some cases indicates that the contact potential between dissimilar metals hinders the formation of a clear, bright coating.

Where heating of the Unichrome dip solution is required, a stainless steel heating coil or Karbate immersion heater should be provided. Work should be agitated during its submersion in the solution, either mechanically or with air-agitating equipment. No filtering, ventilating, or electrical equipment is needed to apply the process.

Operating Conditions and Cycle

Operating conditions for this dip solution are:

Specific Gravity	1.03 to 1.10
Baume	5.5 to 14.0
Temperature	70 to 110 deg. F.
Time	5 to 20 seconds

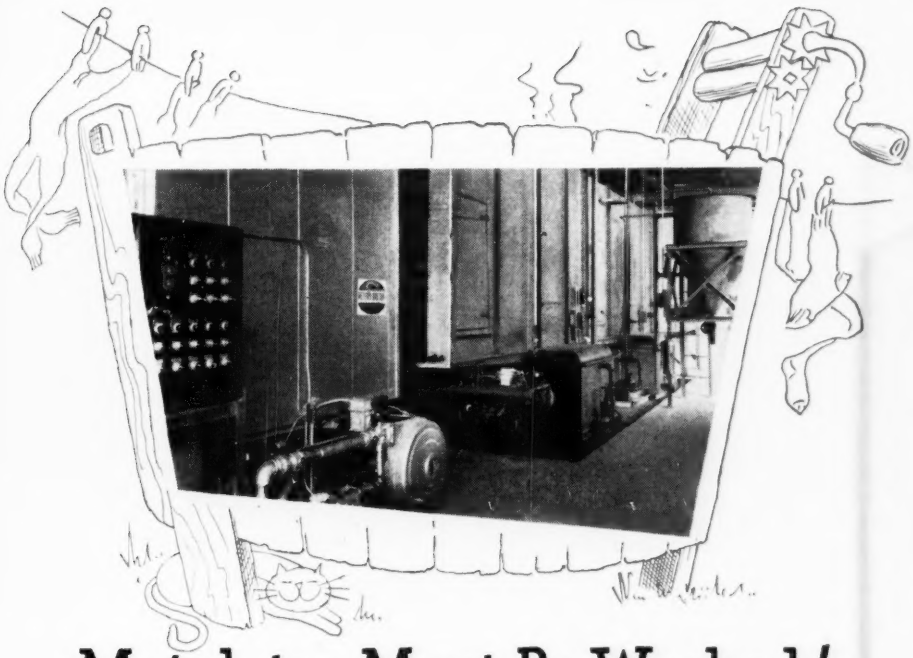
Based on average production experience and processing practice to date, good results are secured with the dip tank operating at room temperature. While 70 to 110 deg. F. is the range permissable as indicated, operation in the upper part of this temperature range forms bright and clear coatings. It is required in those instances where the preceding rinse water is very cold.

Operation in the lower range has been found to favor brightness and uniformity of coating on wire goods and other small work. However, on larger work with flat areas, it tends to produce coatings uneven in brightness. Insufficient dipping time does not provide maximum brightness; while excessive immersion, on the other hand, removes too much zinc from work.

After zinc plating, parts should be given a thorough rinse and then handled no more than is absolutely necessary. Operating cycle of the Unichrome Clear Dip treatment is as follows:

1. Cold water rinse.
2. Acid dip:* 2 to 5 seconds in 2 per

*The acid dip neutralizes any cyanide and alkali dragged over from the plating bath, thus extending the life of the Clear Dip Solution.



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cent (by volume) sulfuric acid; or in ½ per cent nitric acid.
3. Cold water rinse.
4. Unichrome Clear Dip.
5. Cold water rinse.
6. Cold water rinse.
7. Leach dip, 1 to 10 seconds, 80-140 deg. F.
8. Cold water rinse.
9. Boiling water dip (30 seconds).
10. Dry.

Solution Maintenance and Control

In operation, the density of the dip solution tends to rise due chiefly to accumulation of zinc. Even though the Baume readings are high, regular additions of Unichrome Dip Compound 95 are made. Under average conditions, ½ to 1 gallon of Compound 95 is added for each 1,000 square feet of surface that has been treated. If the clear dip bath fails after a period of operation to produce as bright a coating as that originally produced when the solution was first put into use, a replenishment addition of 2 to 3 gallons of Compound 95 per 100 gallons of clear dip solution are made to restore brightness. From 2 to 4 such replenishment additions are generally effective.

To compensate for dragout and neutralization, the bleaching solution requires small additions of sodium carbonate daily. Moreover, as it is quite inexpensive, the solution is simply discarded upon becoming contaminated and turning noticeably yellow in color, and replaced with a fresh solution.

As far as tolerance for impurities is concerned, the dip bath generally has demonstrated good performance in this respect, showing an excellent tolerance for such impurities as soluble metals, phosphates, sulfates, and nitrates. Therefore, it provides reasonably long service where normal care is exercised. However, contamination with alkalies, cyanides, and chlorides must be avoided. Corrosion resistance of this conver-

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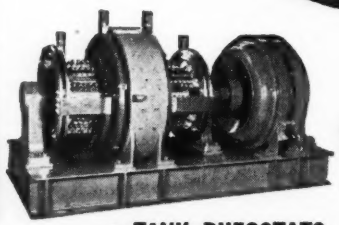

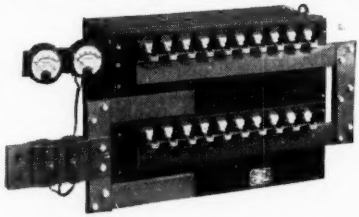

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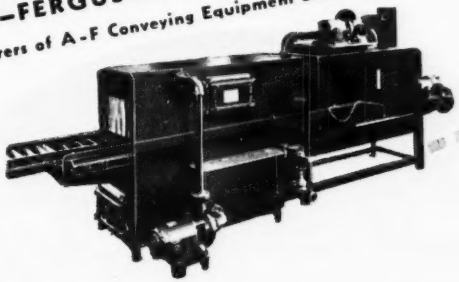

sion coating, as with others, is greatest when the zinc deposit is kept relatively free from heavy metal impurities. The zinc plating bath should be treated periodically, therefore, to prevent accumulation of impurities.

On large flat parts, the clear dip finish may acquire a slight iridescence. Where this condition is objectionable, it can be eliminated by coating the work with a conventional clear lacquer or with a water-dip lacquer. In other cases, clear lacquer or synthetic is applied also to further increase corrosion resistance and abrasion resistance of parts destined for hard wear in subsequent service.

Where freedom from iridescence is necessary another material, Unichrome Dip Compound 97, can be used to make up the dip solution. The Compound 97 dip solution is made up and maintained in a manner similar to that used with Compound 95. The operating cycle is simpler since the carbonate leach and subsequent cold water rinse are eliminated. Parts treated in the Compound 97 solution have a slightly thinner conversion coating and therefore there is less tendency for iridescence to appear.

When applied directly on zinc die castings, the treatment with Unichrome Dip Compound 95 forms a clear, bluish coating integral with the zinc that has an attractive non-tarnishing finish.

Quick dips for zinc, such as the one briefly described here, that prevent corrosion, improve the finish and make paint stick, may be expected to find accelerating usage as knowledge and appreciation of the advantages they provide in production practice spread throughout the finishing field. They merit closer study and analysis, especially under today's conditions when high quality must be maintained and production costs must be kept consistently, uniformly low—two considerations which are becoming increasingly important to more and more manufacturers. For as production experience accumulated thus far with these newer, simpler chemical surface treatments so aptly indicates, such quick dips frequently open up opportunities to solve old finishing problems more economically, without cutting corners at the expense of quality standards.

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Capable of a continuous coating speed of 2500 feet per minute, the Weirton Steel Company's new No. 4 Electrolytic Tin-Plating Line is said to be the largest and fastest in industry.

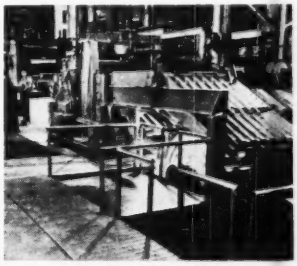
The rated capacity of the new line is 5,000,000 base boxes per year, raising the Weirton Tin Mill production potential to 15,000,000 base boxes annually.

Pickling tanks in the line are 100 feet long... oversize because of the high speed on the strip passing through. The scrubber section, where the steel sheet is washed with hot water to remove carried-over pickling acid, is made of Monel®. Monel was chosen for this application because of its excellent resistance to hot pickling acids... an essential quality for low maintenance costs.

Equipment for the new line was manufactured by the Wean Engineering Company of Warren, Ohio, and the Westinghouse Electric Corporation of Pittsburgh, Pennsylvania. The line was designed by the Weirton Steel Company's own engineering department.

If you – like the Weirton Steel Company – have metal problems involving corrosion or high temperatures, remember that INCO's Technical Service Department is always ready to help you solve them.

Monel scrubber section of new Weirton No. 4 Electrolytic Tin-Plating Line. Monel was chosen because of its high resistance to hot pickling acids. Photos courtesy of the Weirton Steel Co., Weirton, W. Va.



End of Weirton high-speed electrolytic tin-plating line, showing finished tin plate being coiled. The line is the largest and fastest of its kind, making the Weirton, West Virginia, plant the world's largest tin mill.

* * *

Although Nickel and Nickel Alloys are being diverted to defense, INCO advertisements will continue to bring you news of products, applications, and technical developments.

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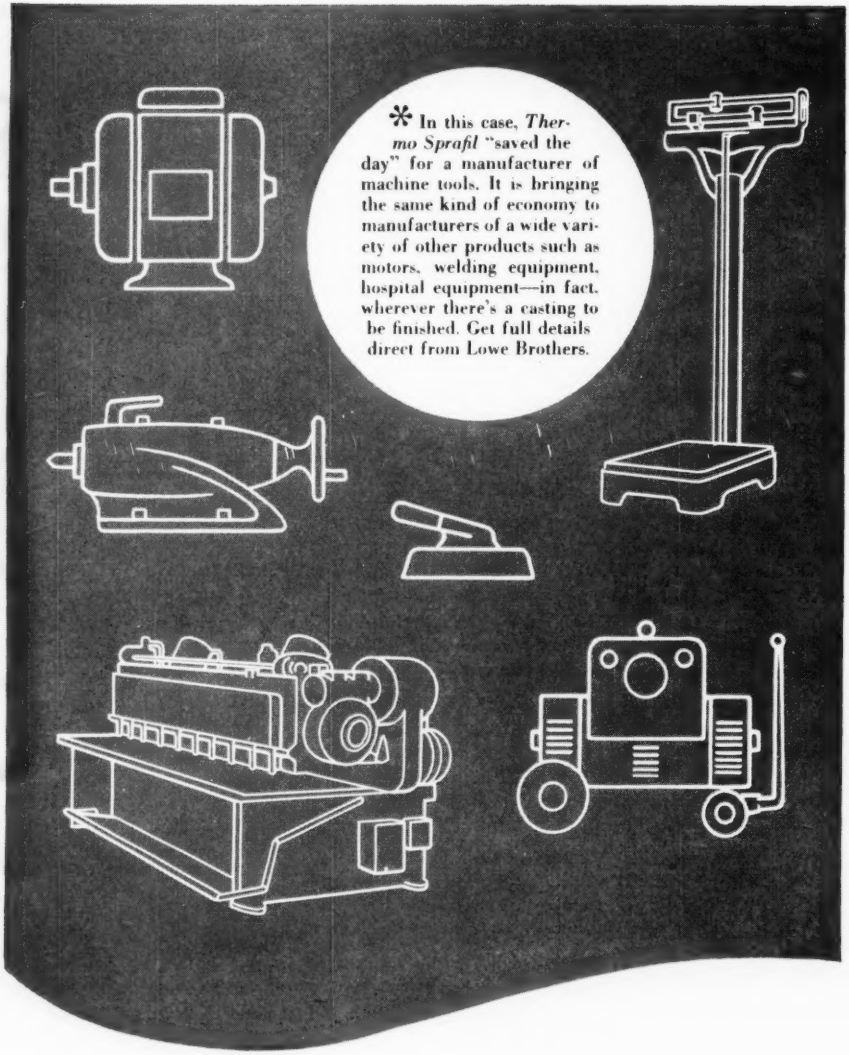
* In this case, *Thermo Sprafil* "saved the day" for a manufacturer of machine tools. It is bringing the same kind of economy to manufacturers of a wide variety of other products such as motors, welding equipment, hospital equipment—in fact, wherever there's a casting to be finished. Get full details direct from Lowe Brothers.

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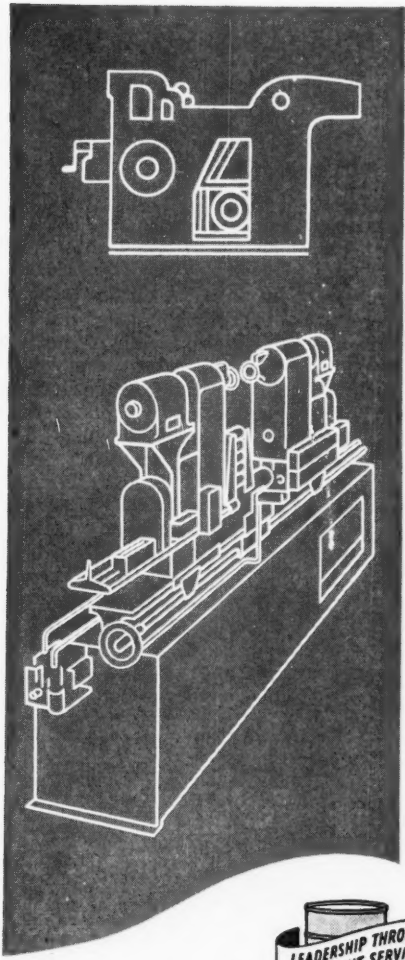

The following experience, reported by a typical machine tool* manufacturer, provides an excellent example of the efficiency effected by Lowe Brothers new *Thermo Sprafil* System. This manufacturer was unable to keep his casting production ahead of machining operations because too much time was required for filling and sanding the castings. A Lowe Brothers "Finishing Specialist" recommended using the new, revolutionary *Thermo Sprafil* System.

Immediately on installation, the *Thermo Sprafil* System produced amazing results. This manufacturer's production has been speeded to the point where he now "stockpiles" castings! There are always plenty of castings ready for the machining operation—and important savings in both time and labor have been enjoyed!

This is just one of many current reports from manufacturers who have enjoyed the benefits of these great *Thermo Sprafil* features. They have learned that *Thermo Sprafil* flows out smoothly, dries rapidly—free from "pin holing"—and greatly reduces sanding time or *eliminates sanding altogether! Thermo Sprafil* may put new economy into *your* operation. No obligation for finding out. Why not write for full particulars now . . . today?

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This advertisement is based on facts taken from Lowe Brothers Industrial Case History Files.

LEADERSHIP THROUGH CONSISTENT SERVICE

Lowe Brothers
FINISHES FOR INDUSTRY

Spraying Paint with Superheated Steam

A PROCESS for spraying finishes on products made on a conveyorized finishing line with steam instead of compressed air has been developed by the Du Pont Company, and is covered in U. S. Patent 2,511,797. It is the result of research started several years ago to provide industry with more efficient methods for the application of paint products.

Steam spraying provides industry with an economical method of applying coating compositions. It does not necessarily provide a better or glossier finish to the refrigerator or other article being sprayed (see Fig. 1). It does effect large savings in the manufacturer's overall finishing costs.

The factors which led to the development of steam spray and the benefits which some manufacturers are deriving from it, and others may, are set forth in the following paragraphs.

Today, most finishing materials used in industry are applied by spray methods, with air as the atomizing medium at pressures normally in the range of 60 to 80 p.s.i. Atomization losses increase as the air pressure is increased. At normal pressures the spray efficiency

Fig. 1—Operator uses steam spray gun and equipment to paint water heater tanks in production finishing plant of large appliance manufacturer. (*Photo courtesy American Brake Shoe Co., Kellogg Div., Rochester 9, N. Y.*)

rarely exceeds 65 per cent, and is usually well under that figure.

Spray losses may be divided into two categories when air is used as the atomizing medium; namely, (1) overspray losses which occur when the spray fan is projected beyond the edge of the ware; (2) atomization losses in the form of paint particles which are diverted from the ware by the rebounding air stream. The losses from this source are usually greater than the overspray losses.

Advantages of Steam Spraying

The phenomenon involved when superheated steam is released from a paint spray gun is immediate dissipation of velocity energy into the paint and the immediately surrounding atmosphere. There is, therefore, a minimum of turbulence at the surface of the ware being coated.

The most evident advantages of steam spray versus air spray are:

1. Actual material savings of the order of 10-20 per cent in most applications. Obviously this magnitude of the savings is influenced by factors such as local conditions, size and shape of article being coated, and so on.
2. In some cases the film thickness per coat can be increased by steam application. The difficulties of pinholing and popping, normally caused by trapped air, are reduced.
3. Fewer cleanings of the spray booth are necessary because of the reduced spray losses.
4. Basically, steam is a cheaper propellant than compressed air, although be it steam or air, the operating cost of the propellant is a relatively minor one.
5. Increased film thickness per coat and fewer coats can result in labor savings, as well as lower cost of drying or baking.
6. Steam spray makes it possible to apply finishes heavier in body and higher in solids, thereby saving at least a portion of the cost of the reducing thinners required.

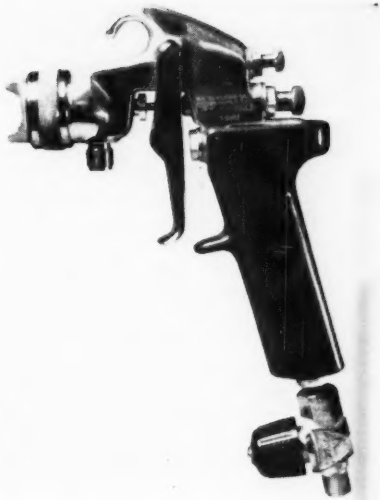

Fig. 2—DeVilbiss Type JGA-550 steam spray gun is designed to provide the necessary insulation for comfortable operation, and prevent the formation of moisture inside the forged aluminum gun body and head when the gun is used in intermittent operation. The fluid tips and cap are specially designed for steam spraying with the synthetic materials usually applied by this method. Excessive weight and hose drag on the overhanging head of the gun have been eliminated to reduce operator fatigue to a minimum.
(Photo courtesy The DeVilbiss Co., Toledo 1, Ohio)

Engineering Requirements

The equipment required for a steam spraying installation is summarized below:

1. A steam source under at least 100 p.s.i., and preferably 125 p.s.i. pressure so that 60 p.s.i. is available at the spray gun.
2. Steam separator to reduce the amount of moisture in the steam.
3. Strainers to keep dirt out of the system.
4. Trap to discharge moisture automatically.

5. Regulator to reduce steam line pressure to correct spray gun pressure.
6. Thermometer to indicate steam temperature.
7. Steam pressure gage.
8. Superheater to raise steam temperature and dry the steam, so that the steam is delivered to the spray gun with a superheat of 10 deg. F.
9. Steam hose adequate for temperature and pressure required.
10. Special steam spray gun (see Figs. 2, 3, and 4).
11. Usual pressure tanks and circulating lines to deliver paint to the spray gun.

Figure 5 shows diagrammatically the essential elements of a steam spray installation.

Plants with a steam source of 125 p.s.i. pressure can install necessary auxiliary equipment to utilize the steam spray process. For plants where steam of the required volume and pressure is not available, there are specially designed steam generator units. One such unit is an all-electric, packaged boiler plant, developed by Livingstone Engineering Company, which consists of an electrically heated 100 p.s.i. boiler, feed water pump, motor, controls, and electric superheater. Obviously, such units (Speedylectric) can be installed close to spray booths, thus avoiding excessive pipe or hose lengths and resultant dangers of moisture condensation.

Although larger steam-spray boilers are available, the practical size seems to be one that will provide steam for from 1 to 8 spray guns. To keep the moisture content of the steam below 2 per cent at the gun nozzle, a separate superheater is installed in the

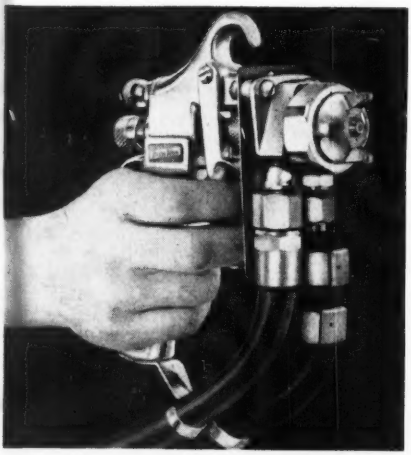

Fig. 3—The Kellogg S-100 steam spray gun has incorporated insulation and radiation design features to dissipate the heat and enable the operator to use the gun in comfort. Hose supports for steam and material lines reduce downward drag on the spray head so that it is less tiring for the operator. Other features include a built-in finger guard, an adjustable fluid nozzle, and a spray head with one-piece, easy-to-clean steam cap and fluid nozzle. *(Photo courtesy American Brake Shoe Co., Kellogg Div., Rochester 9, N. Y.)*

Fig. 4 — This special Binks precision steam spray gun is designed and constructed so that the steam enters the gun just below the nozzle. The paint to be sprayed enters the gun through the aluminum gun handle, thus keeping it cool. *(Photo courtesy Binks Manufacturing Co., Chicago 12, Ill.)*

steam line as close to each individual spray gun as possible. Under these conditions the amount of moisture deposited in the paint film is insignificant.

Operational Factors

As can be imagined, conventional air spray guns cannot be used for steam spraying because they would be too hot to handle, but the special spray guns here illustrated are quite satisfactory. It is recommended, however, that operators wear gloves as a matter of good practice. The superheated steam cools so rapidly that the operator can pass his hand through the spray at a distance of 12 to 15 inches from the gun with little or no discomfort.

Du Pont's production experience to date has been largely with the alkyd and alkyd urea formaldehyde type finishes so widely used in the finishing industry. Laboratory experience, however, indicates suitability for a wide variety of finishes.

It should be pointed out that the steam spray process is not in the same category as the hot spray process of painting and lacquering. The latter process employs heaters to warm the finishing material before it is applied. Steam spray, on the other hand, refers to the actual process of paint atomization at the spray gun, and, therefore, is useful in conjunction with hot spray equipment.

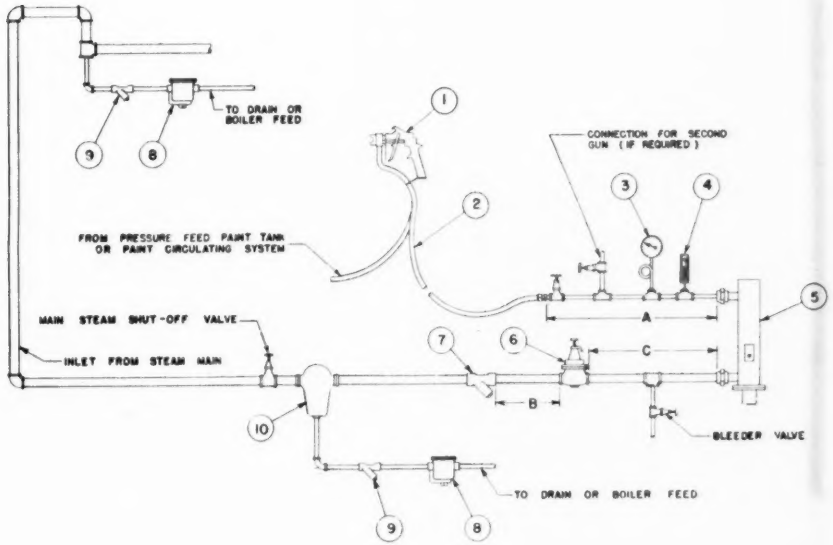

Fig. 5—Typical layout for a steam spray installation.

1. Steam spray gun.
2. Special steam hose.
3. Pressure gage, 0-150 p.s.i.
4. Mercury thermometer, 0-500 deg. F.
5. Steam superheater.
6. Pressure regulator, 1-inch.
7. Strainer, 1-inch.
8. Steam trap, ½-inch.
9. Strainer, ½-inch.
10. Steam separator, 1¼ inches.

NOTE: All lines up to steam hose to be fully insulated except for separator drain, drip line, and bleeder line. Line from separator to superheater should be 1 inch; line from superheater to steam hose should be ½-inch.

(Illustration courtesy American Brake Shoe Co., Kellogg Div., Rochester 9, N. Y.)

For more complete information on products and processes use READER SERVICE CARDS inside covers.

Although the basic principles of steam spray are comparatively simple, prospective users should realize that a definite amount of "know how," in addition to the special equipment mentioned herein, is necessary to ensure foolproof operation.

In the use of color in industry, level of brightness and degree of contrast are more important than hue quality.

An ideal seeing condition (involving soft and uniform values) may be green, blue, yellow, or pink as special circumstances suggest. The pupil of the human eye regulates itself to light intensity, and this regulation will be approximately the same for light green as it will be for light buff.

It has been found at the Color Research Laboratory of Sun Chemical Corporation that color as color, however, is important in building up acuity through complementation for purposes of high visibility, and in establishing definite emotional and phychological effects.

The psychology of color for industry may be briefed as follows:

1. For working areas, colors may be light in tone and weak in purity. Too much richness may be emotionally distracting.

2. For critical seeing, brightness is best concentrated or confined to important fields of view such as machines and work tables. For casual seeing, brilliant color and strong contrast should mark the object or area that is to be distinguished.

3. End walls faced by workers may be colored in soft, grayish blues or greens, to provide areas for visual relaxation.

4. Most suitable colors for walls or machines are soft, grayish greens, blue-greens, blues, tans, buffs. These should be subtle. Strong colors weary the eyes and tend to form disturbing after-images.

5. Where working conditions involve exposure to high temperature, pale green and blue-green are best employed. By illusion they will tend to lower apparent temperature. In cold, vaulty environments, buff, ivory, and yellow tones are practical. They are "warm" in effect and apparently increase temperature.

6. For employee washrooms, rest rooms, cafeterias, stronger colors are appropriate. They will offset work fatigue and relax the tired or nervous employee by providing an interesting variety.

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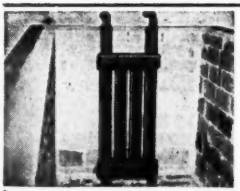

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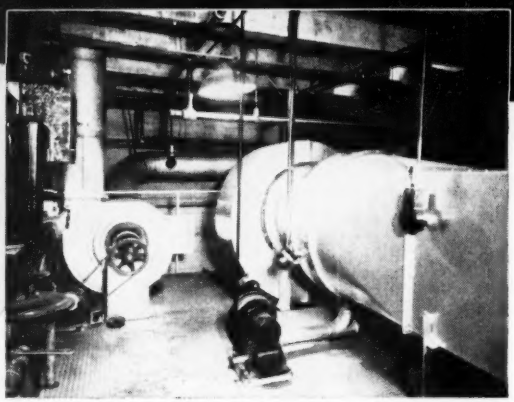
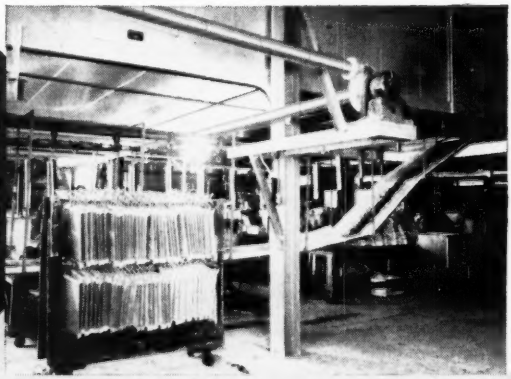


For the installation illustrated below, the heating equipment, control panel and safety equipment shown here are suspended above the floor to save valuable space.

Conveyor type paint baking and dehydrating oven installed in the plant of a large refrigerator manufacturer. This large oven serves a double purpose, baking the finish on the parts and preparing them for dehydration at the same time.



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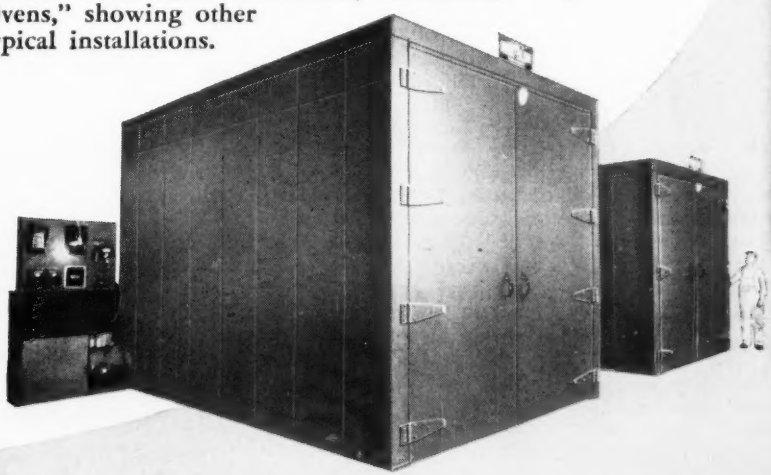
Two batch type ovens, direct gas fired and of the recirculating type. These ovens operate at 450° F. and are used for processing corrosion-resistant finishes.



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Spotlighting FINISHING Progress

Recent Developments in Ceramic Coatings for Steel

By DR. ALLEN G. GRAY

THE life of porcelain enamel coatings depends to a large extent upon the proper selection of composition to meet a given environment and freedom from coating defects. In order to improve enameling processes and materials, studies are being conducted on the mechanism of adherence of ceramic coatings to steel. Other recent work has been carried out to correlate weather resistance of porcelain enamels with chemical-test data and to study factors affecting abrasion resistance. Ceramic coatings have been developed for the protection of metals against corrosion which occurs as a result of oxidation at high temperatures. High thermal-shock resistant coatings of this type, used in World War II on exhaust systems for amphibious jeeps, tanks, and airplanes where service conditions were severe, are finding a variety of new applications. There are cases where such coatings are replacing hard-to-get materials vital to defense production.

The Adherence Research Group, sponsored by a number of industrial concerns, has undertaken a research project at Battelle Memorial Institute to investigate the basic factors associated with the development of adherence of porcelain enamels, glass, and ceramic type coatings to iron and steel. The objective of this research is to learn more about the mechanical, chemical, and physical nature of the reactions which take

A Monthly Digest of Current Technical Progress Indicating Significant Trends and Developments in the Finishing Industry

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place during the firing of an enamel to the base metal. Positive knowledge of the phenomena connected with adherence should result in reduced costs for operation of enamel plants through increased and more predictable production, reduced reoperation, and reduced scrap. This research is expected to provide a basis for the development of enamels for thinner application by controlling the interfacial reactions between the enamel and the base metal, resulting in less damage in transit and in field service. Inasmuch as the entire industry, including the raw materials suppliers, frit manufacturers, steel producers, enamel shop suppliers, and the users of enamel products, stands to benefit, the problem has been attacked on an industry-wide scale.

At the 99th Meeting of the Electrochemical Society, held in Washington, D. C., Dr. W. N. Harrison, National Bureau of Standards, reviewed the principal theories for adherence of porcelain enamels to steel. Current investigations on the mechanism of adherence of ceramic coatings at the National Bureau of Standards is sponsored by the National Advisory Committee for Aeronautics. The roles of cobalt and iron and their oxides in promoting adherence are being studied by autoradiographic methods, through which their distributions in the coating layer and interface, and their migrations, can be followed.

According to Dr. Harrison, one-half of one per cent of cobalt oxide in a ceramic coating can make all the difference between excellent adherence or extremely poor adherence of the coating to the underlying metal. He pointed out that by the accepted method of classification there are six principal theories of adherence: (1) mechanical gripping; (2) dendrite theory; (3) electrolytic theory; (4) the hydrogen theory; (5) the oxide layer theory; (6) chemical-union bond theory.

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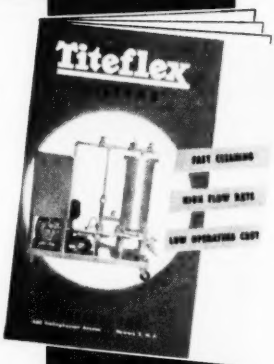

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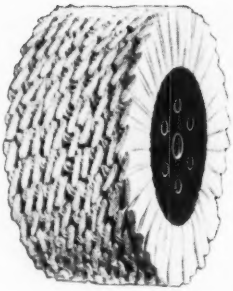

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A sheet of steel at the interface with the enamel has small scale irregularities. According to one theory, the peaks, valleys and a few undercuts in the metal surface provide adherence due to mechanical gripping. Dr. Harrison postulated that it is safe to say that this is one of the significant factors in adherence, but by no means the only one.

The dendrite theory might be regarded as an amplified mechanical gripping theory. It has been found experimentally that under certain conditions dendrites of iron or metallic cobalt are formed in such a way that they are attached to the sheet and branch out into the enamel. The cobalt is reduced and precipitated from the enamel to form the dendrites. Since these have been reported to be present when the adherence is good and absent when adherence is poor, the inference is that they act as fingers to grip the enamel and hold it in place.

According to the electrolytic theory, any metal between iron and copper in the electromotive series, when dissolved in the enamel will be precipitated out of solution and plated on the steel, when the coating is fired on, due to electrolytic action of the hot iron base. It has been postulated that cobalt, nickel and antimony specifically plate out on the steel from the enamel and promote adherence because they are intermediate in thermal expansion between the steel and the enamel. The actual adherence of the enamel to the plated out layer of metal on the steel is generally postulated as due to mechanical gripping aided by dendrites of the precipitated metal; thus, we have an amplication of the previously discussed theories. According to Dr. Harrison, this theory does not answer the question of why cobalt is so much more powerful in promoting adherence than is nickel and other metals appropriately placed in the electromotive series.

The hydrogen theory proposes that the hydrogen evolved during the fir-

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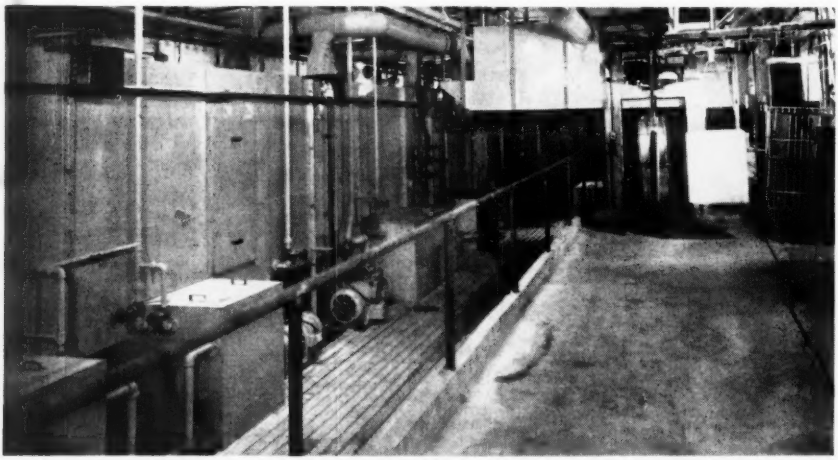
ing of enamel on sheet steel forms a blanket over the steel and prevents the enamel from wetting the steel, unless cobalt is present to interfere with it. When cobalt is present, it is postulated that it acts as an oxygen carrier and forms iron oxide at the interface. The iron oxide gives up oxygen to the hydrogen, forming water which dissolves in the enamel and thereby clears the way for a normal mechanical gripping action. The oxide layer theory proposes that a very thin layer of ferrous phase, approximately FeO in composition, is required at the interface to provide adherence, which it does by acting as a cement.

In discussing the chemical-union bond theory, Dr. Harrison stated that it postulates that iron oxide forms at the interface and then is dissolved by the enamel. The cobalt acts as an oxygen carrier to provide new oxide formation, and also facilitates the solution of iron oxide in the enamel. This new oxide is also dissolved, but the cobalt maintains a proper balance between the rate of formation and the rate of solution of the iron oxide. Recent X-ray diffraction studies have given data which support this theory. It is reported that the iron oxide layer is formed and then dissolves, and that adherence results from the sharing of oxygen atoms between the enamel and the steel.

Isotopic Tracers Applied to Adherence Studies

Dr. Harrison described work being carried out at the National Bureau of Standards wherein stable and radioactive isotopic tracers are used to study the mechanism of adherence of porcelain enamels. As a stable tracer, deuterium (heavy hydrogen) is used to supply tagged atoms of hydrogen that can be introduced where desired, recovered and evaluated quantitatively by use of the mass spectrometer. To trace the formation of iron oxide at the interface, and its solution in the enamel, and to study the distribution of cobalt oxide

Fig. 1—Continuous spray cleaning and pickling machine for porcelain enameling at Landers, Frary and Clark, New Britain, Conn. View shows washing machine tubs just entering the emulsion cleaner spray compartment. Following are two large end panels suspended vertically and then a crate of oven door panels. The tanks and pumps for each solution used in the treatment are placed under the spray tunnel.
(Photo courtesy Metalwash Machinery Corp., Elizabeth 4, N. J.)



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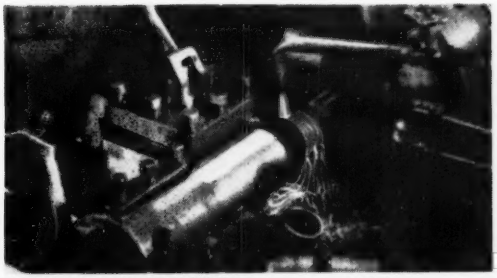

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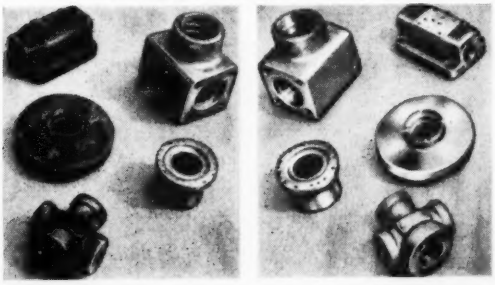

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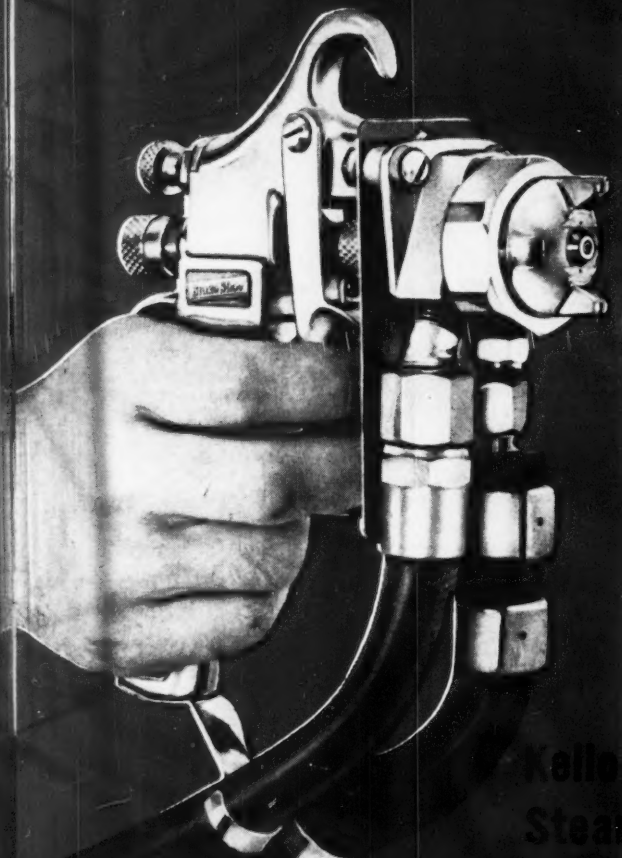

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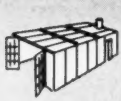

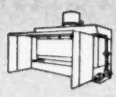

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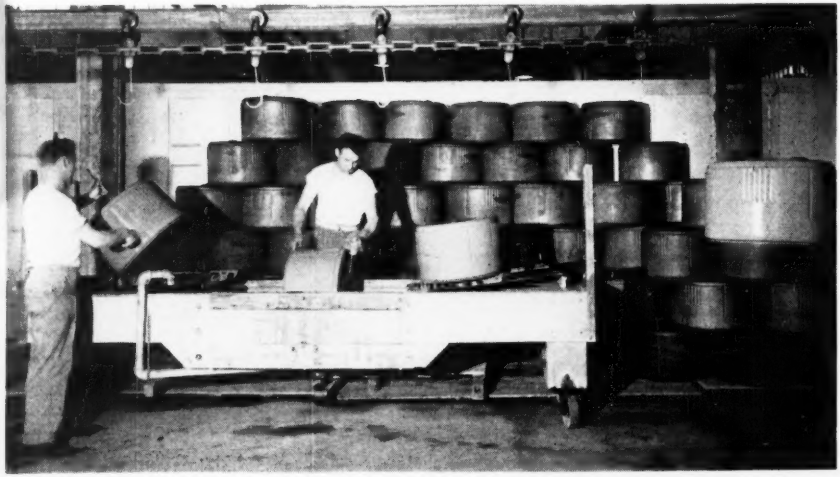
in the enamel and the precipitation of metallic cobalt at the interface, radioactive iron and radioactive cobalt are used. Dr. Harrison pointed out that radioactive cobalt was incorporated into the enamel ground coats, and sheets of steel to be enameled were made radioactive by irradiation in a pile at Oak Ridge.

One object of the studies conducted by Dr. Harrison was to determine just which of the various steps involved in applying a coating of porcelain enamel to steel are the ones in which most of the defect-producing hydrogen is introduced. Tests were conducted in which heavy water or deuterium oxide was substituted for ordinary water in the pickling acid solution, in the raw clay used with the mill batch, in the frit or the enamel glass itself, and it was used instead of regular water for quenching the molten enamel and milling the quenched frit. To permit study of the various factors these substitutions were made one at a time. The tests were designed to study the various steps involved in commercial enameling operations, such as are illustrated in Figs. 1 through 4.

In describing the first experiments conducted, Dr. Harrison stated that to facilitate expulsion of the ordinary hydrogen and the deuterium (heavy hydrogen) from the specimen of enameled steel, the cobalt oxide and other adherence-producing oxides were left out of the enamel. As a result, the adherence of the enamel on the test pieces was very poor. The hydrogen in the metal, both ordinary hydrogen and heavy hydrogen (deuterium), gradually came to the interface after the coated piece was cooled, and collected there, building up in pressure until it ruptured the enamel. This accumulated pressure was possible because atomic hydrogen diffused through the steel to the surface, there combining to make molecular hydrogen, which could not diffuse back into the steel, so that it was an irreversible process.

In other tests, the frit was suspended in cellosolve instead of water to form the slip or slurry. This procedure got rid of most of the defect-producing hy-

Fig. 2—Tubs being dipped after surface preparation in the continuous machine at Landers, Frary and Clark.



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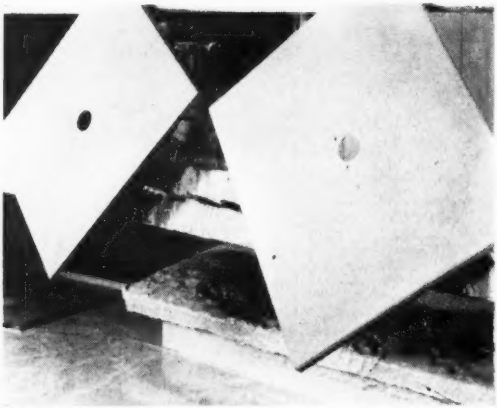

Fig. 3 — Porcelain enamel parts draining over dip tank.
(Photo courtesy Ferro Corp., Cleveland 5, Ohio)

drogen in the steel. Dr. Harrison postulated that as the test specimens were fired, the water dissolved in the frit reacts with the hot iron to form iron oxide and hydrogen, which dissolves in the steel. As the specimen cools after firing, this hydrogen is squeezed out of solution, slowly approaching an equilibrium content in the steel, and producing poor adherence characteristics. When the dehydrated frit was "deuterated" the defects occurred just the same as for normal frit. Another point brought out by Dr. Harrison was that when the amount of water dissolved in the frit was reduced by partial dehydration of the raw materials, before melting them to form the frit, a noticeable reduction in the amount of adherence defects occurred.

Dr. Harrison reviewed the various tests in which deuterium oxide, or heavy water, was substituted for ordinary water. In each case the hydrogen which ruptured the enamel coating was collected in a container and by means of the mass spectrometer the percentage of deuterium in the total hydrogen gas was determined. The results showed that milling water, acid pickle water, water in the clay, and quenching water were all important sources of hydrogen. However, Dr. Harrison emphasized that when the enamel frit was replaced by deuterium oxide, the recovery of deuterium was very large, showing that dissolved water in the frit was outstandingly the most important source of defect-producing hydrogen. However, it was pointed out that good adherence is not obtained by merely getting rid of hydrogen; even when the hydrogen is at a low level

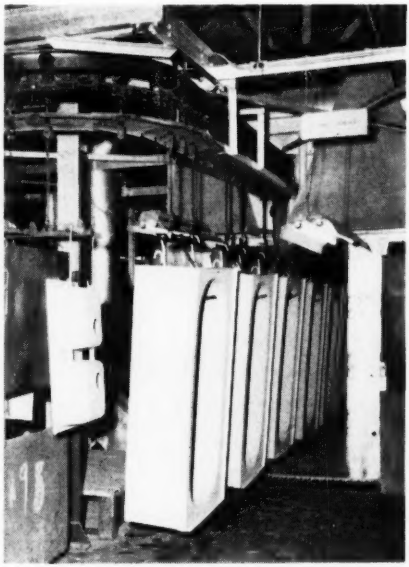

Fig. 4—Continuous furnace line in the plant of the Norris Stamping and Enameling Co., Los Angeles, Calif., producer of porcelain enameled bath tubs.
(Photo courtesy Ferro Corp., Cleveland 5, Ohio)

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the enamel will still pop off the steel in large flakes when the specimen is bent.

Other tests were carried out where radioactive cobalt was substituted for ordinary cobalt oxide in the ground coat enamel, and in some cases steel containing radioactive iron was used. Studies were conducted in which enamel containing ordinary cobalt oxide was put on radioactive steel and the results were studied by means of the autoradiograph. Dr. Harrison pointed out that the word autoradiograph means simply a picture taken automatically by means of radiations from radioactive materials. In this case, since the steel was radioactive, all of it was dissolved by means of a solution of iodine and potassium iodide. This solution does not attack the enamel or iron oxide inclusion. The steel that was dissolved away was replaced with plastic in the mounted section. Then the autoradiograph was made in which the effect of radioactivity was shown in black on the negative and in white on the print. A microdensitometer was used to determine the locations on the autoradiograph that were most affected by radioactivity. Isotopic tracer methods, such as these developed by Dr. Harrison, will be very important in future studies on the mechanism of adherence of ceramic coatings on steel.

Weather Resistance of Porcelain Enamels

Recent tests have been conducted by B. J. Sweo, Ferro Corporation, to correlate the weather resistance of porcelain enamels with chemical test data. The increasing use of porcelain enamel as an architectural finish has emphasized the need for data that will be of value in predicting the service life of installations made of porcelain enamel. In these tests, 21 enameled specimens were exposed for approximately 10

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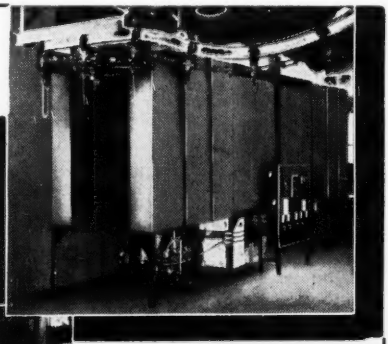

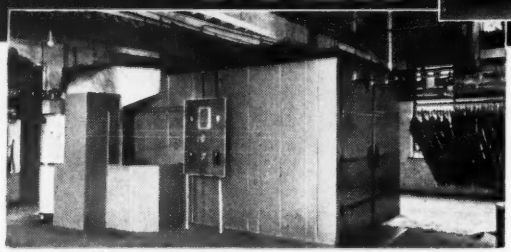

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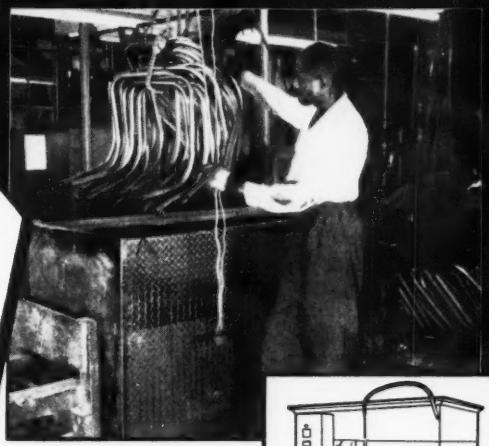

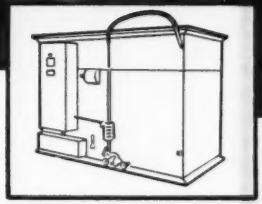

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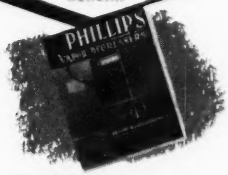

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months in an industrial area and were graded visually by 10 observers for weather resistance based on appearance change as compared with an unexposed standard.

The chemical tests were conducted on 4 x 4-inch specimens of 20-gauge enameling iron, coated with the same type of enamel, and prepared at the same time as the exposure test specimens. These tests showed that there was apparently no correlation between weather resistance of porcelain enameled surfaces and resistance to boiling distilled water and boiling 5 per cent sodium pyrophosphate solution. However, a definite relationship was found between weather resistance and resistance to boiling 6 per cent citric acid solution. All the specimens that were considered by the observers to have suitable weathering properties showed relatively low weight losses when subjected to the boiling citric acid test.

The boiling tests consisted of maintaining a boiling solution of the test reagent in contact with a weighed specimen for 2½ hours. At the end of the boiling period, the specimen was washed with distilled water, dried, and weighed and its loss of weight was determined. The loss of weight was reported as grams loss per square inch of surface exposed. The acid resistance tests were carried out in the manner outlined by the Porcelain Enamel Institute*. With the exception of one specimen, good correlation was found between percentage gloss retained after acid testing according to the P. E. I. method, and weather resistance.

The enamels tested by Sweo represented a wide variety, ranging from compositions with firing temperatures near 1350 deg. F., to current conventional enamels that in some instances required firing temperatures approaching 1600 deg. F. Specimens were cleaned and then compared with a reference

* Test for Acid Resistance of Porcelain Enamels: I, Flatware Products Standards Section, Porcelain Enamel Institute, Inc., Apr., 1940.

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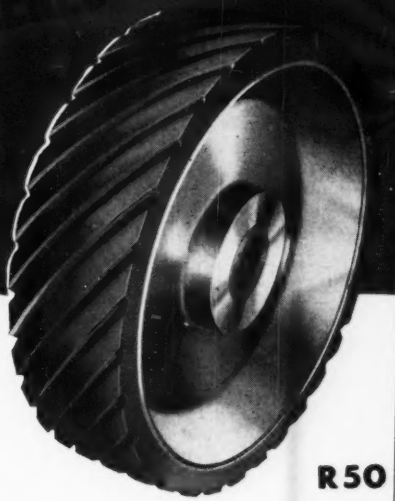

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TABLE I.

RESULTS OF CHEMICAL TESTS AND APPEARANCE CHANGE ON PORCELAIN ENAMELS EXPOSED TO WEATHER FOR ABOUT 10 MONTHS. AVERAGE OF RATING GIVEN — LEAST CHANGE RATED ZERO; GREATEST CHANGE RATED 20.

Type of enamel*	P.E.I. acid-resistance test (class)	Weather-ability rating	Gloss retained (%)	Weight loss (gm./sq. in.)			Appearance change on weathering
				Water	Alkali	Acid	
A.R. titania, white	B	0.8	83	0.005	0.0005	0.001	No change
A.R. clear, red	AA	1.7	93	.004	.002	.0008	No change
A.R. antimony, white	A	2.4	83	.008	.003	.0006	No change
A.R. clear mat, red	B	2.5	71	.005	.003	.003	No change
A.R. titania, white	A	4.5	93	.005	.003	.003	Slight loss of gloss
A.R. clear, red	B	4.7	54	.008	.006	.007	Slight loss of gloss
A.R. titania, white	B	5.0	85	.008	.003	.002	Slight loss of gloss
Clear, red	C	6.4	28	.009	.003	.008	Slight loss of gloss
Ground coat, 1580°	D	8.9	39	.007	.003	.026	Faded, slight loss of gloss
Antimony, white	D	9.8	21	.001	.0008	.022	Brown coloration, loss of gloss
Molybdenum, white, 1350°	D	11.0	18	.012	.053	.126	Loss of gloss
Antimony, white	D	11.9	21	.0006	.0009	.015	Loss of gloss
Smelted blue	D	12.8	15	.0006	.002	.032	Faded, loss of gloss
Antimony, orange	D	12.9	18	.0009	.0009	.026	Faded, loss of gloss
Ground coat, 1350°	D	13.6	18	.005	.019	.019	Faded, loss of gloss
Zircon, white	D	13.7	23	.0007	.0008	.283	Brown coloration, loss of gloss
Antimony, white, 1350°	D	14.1	18	.001	.002	.346	Brown coloration, loss of gloss
Clear, red	C	16.8	41	.001	.001	.053	Faded, decided loss of gloss
Zircon, white, 1350°	D	18.1	19	.001	.0008	.511	Brown coloration, loss of gloss
Ground coat, 1530°	D	18.9	15	.001	.013	.275	Faded, loss of gloss
A.R. clear mat, red	A	19.5	76	.0007	.051	.115	Badly faded

* A.R. means acid resisting.

(Tests conducted by B. J. Sweo, Ferro Corporation, and reported before The American Ceramic Society.)

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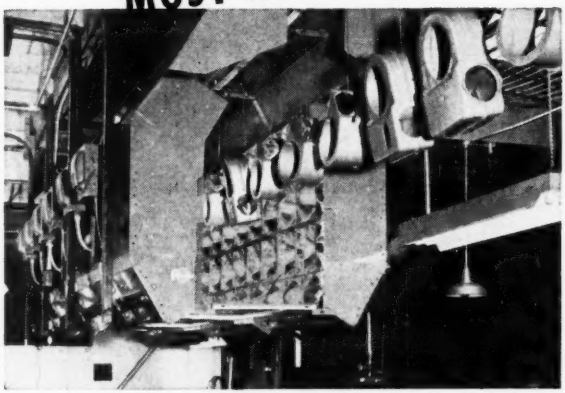
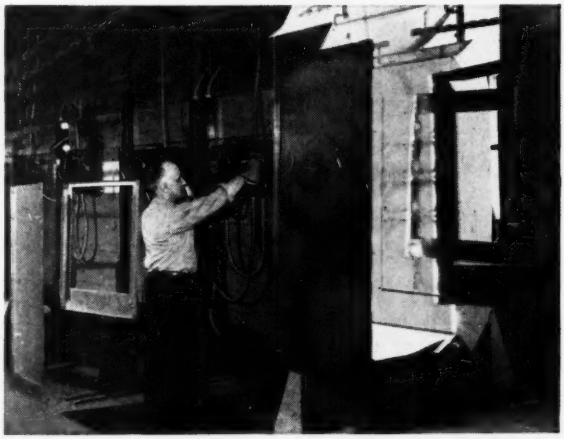
Automatic Burner Corp. of Chicago now finish bakes oil and gas burners with Fostoria Infrared. Here the light weight Fostoria oven is suspended from the ceiling, saving considerable floor space. The conveyorized system saves much handling. 350 units are now turned out in 8 hours compared with 150 units previously, and finishes are more durable and attractive. No heating up time is required — production is instantaneous with complete flexibility of control.



●

"When you have limited floor space and want to get out maximum production, this is the only efficient way to do it," says H. O. Buschman, Plant Engineer at Perfection Stove Co., Cleveland. The Fostoria oven requires only half the floor space previously needed for a fuel fired oven. A variety of furnace panels, bases, etc. are now finish baked in 6 minutes at the rate of 80 pieces per hour. The flexibility of the Fostoria oven permits switch control of each bank for full or half voltage to vary heat intensity according to production requirements. All handling is eliminated except at inspection and transfer points.



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Throughout industry, new high standards of production efficiency are being set by the utilization of the Fostoria Infra-red System. Savings in "per piece" production cost are substantial with many additional advantages on both large and small operations. *A Fostoria Evenray System will out-perform any other equipment on the market today.* Fostoria engineering combined with exclusive equipment features guarantee the fastest, finest finish baking in a minimum of space at lowest operating cost. Investigate what Fostoria Infra-red can do for you. Case histories of installations applicable to your production are available on request.

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standard and rated numerically for change of appearance. Table I summarizes the results obtained with the various coatings. The specimen showing the least change was assigned the number zero; the one showing the greatest change was assigned the number 20. The other specimens were distributed

Fig. 5—The Taber Abraser was used in tests recently conducted to compare the abrasion resistance of various types of porcelain enamels. Shown here is an instrument of this type with vacuum pickup attachment.
(Photo courtesy Taber Instrument Corp., North Tonawanda, N. Y.)

in between. The average of 10 ratings was the weatherability rating.

Abrasion Resistance of Porcelain Enamels

In a recent talk before the Midwest Enamelers Club, Arthur V. Sharon, Chicago Vitreous Enamel Product Company, presented data to show how the abrasion resistance of the present one-coat enamels compares with the old two-coat enamels. Manufacturers have probably thought about this question many times in view of the increasing use of thinner cover coat enamel application on such items as sinks, ranges, tubs, and table tops which may be subject to wear or abrasion over long periods of time. In the tests conducted by Sharon, a Taber Abraser (Fig. 5) was used to compare the abrasion resistance of various types of porcelain enamel.

Table II shows the types of enamels tested and the results obtained. The specimens tested were 4 x 4 inches, prepared from 20-gauge enameling iron. All specimens were treated in the normal nickel pickle, then coated with the conventional ground coat (Enamel A) followed by a cover coat. After completion of the test cycles noted, the specimens were cleaned, washed in alcohol, dried in a stream of warm air and weighed. The loss in weight in milligrams is also shown in Table II. Fax-film replicas were also made of the surfaces at these various intervals.

Sharon pointed out that both titanium opacified enamels exhibited exceptional wear resistance. The zirconium opacified enamel, having abrasion resistance comparable to the titanium enamels in the early stages of abrasion, failed rapidly to become comparable to the ground coat and the acid resisting antimony enamels.

The non-acid resisting antimony enamel with the least wear resistance showed a weight loss almost twice that of the ground coat, the acid resisting antimony, or the zirconium enamels. The weight loss of the latter three enamels was approximately five to six times that of the titanium enamels. The tests conducted by Sharon show that the thinner application of titanium opacified enamels is advantageous for use where abrasion resistance is required. Their resistance is much greater than the one-coat zirconium and the two-coat antimony enamels.

Heat Resistant Enamels

In any discussion of coatings for protection against oxidation corrosion at

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TABLE II.

RESULTS OF ABRASION RESISTANCE TESTS CONDUCTED ON VARIOUS TYPES OF PORCELAIN ENAMELS USING THE TABER ABRASER

Enamel	Type	Average Loss in Weight (Milligrams) at Various Wear Cycles			
		2500	5000	7500	10,0000
A	Ground Coat	11.6	21.0	31.1	39.8
B	Antimony Opacified Non A.R.	11.2	26.5	45.6	73.5
C	Antimony Opacified A.R.	6.8	16.4	28.2	40.9
D	Zirconium Opacified	5.0	13.5	28.0	47.1
E	1520° F. Titanium Opacified	2.2	4.6	7.8	8.3
F	1450° F. Titanium Opacified	1.5	3.4	5.2	6.8

(Tests conducted by Arthur V. Sharon, Chicago Vitreous Enamel Product Co., and reported in "Better Enameling."

elevated temperatures, it should be remembered that porcelain enamels have been used successfully for years for this purpose; for example, on the burner grates of gas stoves. However, the commercially available porcelain enamels which require firing temperatures generally below 1600 deg. F. are not adequate for protection for extended periods of time at temperatures near or above their firing temperature.

With the critical alloy metal supply problems of World War II and the ever increasing demands for the efficiency of higher operating temperatures, work was carried out at a number of locations to develop ceramic coatings for use in high temperature metal protection. Now, it may be said that the use of heat-resistant enamels should be considered for applications where corrosion of metal occurs due to a high temperature environment. One large field for the use of coatings of this type is in systems in contact with exhaust gases from combustion processes; for example, furnace flues, heat exchangers, exhaust pipes and mufflers of internal combustion engines (Figs. 6 and 7). In many cases a coated steel section may replace one made of a more expensive metal, or replace a thicker section and thereby effect economies of construction as well as ensure improved performance. Some specific ceramic coating applications to be considered in the National Defense Program have been given by Professor Dwight G. Bennett, University of Illinois, as follows: exhaust stacks or collector rings; tail pipes; tail cones; flame tubes; turbine buckets; for insulating foil blankets. Considerable work has been carried out at the University of Illinois on high temperature ceramic coatings with the Air Materiel Command as sponsor.

Work has also been carried out with a view toward increasing the heat resistance of coatings made with commercial ground coat frits by including substantial amounts of refractory materials. In addition to increasing the general refractoriness of the coating, the material added also reduced cracking of the coating by thermal changes encountered in service. A blend of two frits is used in this coating permitting variation in maturing temperature by varying the proportions of the "hard" and "soft" frit members. This type of

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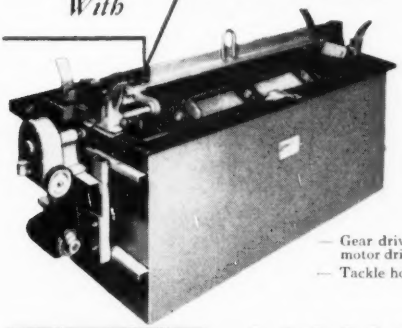

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coating is suitable for application to low-carbon steels, stainless steels and alloy steels such as Inconel. The firing temperature is generally in the neighborhood of 1600 deg. Fahrenheit.

Several coatings have been developed for protection of alloy steels which have as their basis frits which mature at temperatures in the 1800-1900 deg. F. range. The frits require considerable higher smelting temperatures than commercial enamel frits. The coating enamels generally consist of a blend of frits and may or may not contain additions of refractory material. This type of enamel has been successfully used on combustion chambers of gas turbines. Some work has been done on alloy steel with a glass-like coating which may be classified as a modified barium aluminum silicate. One coating of this type matures at temperatures around 2200 deg. Fahrenheit.

Application Technique for High Temperature Enamels

According to information made available by the Ferro Corporation, sandblasting or shot blasting is the best means of preparing metal for application of heat-resisting enamels. Some metals can be acid etched, but with such materials as stainless steels and Inconel, acid etching procedures are impractical and unsatisfactory. Enamel slips for high temperature application are prepared in the same manner as commercial enamel slips except for refractory mill additions, increased water content, and the fineness of milling.

The practice with enamels of this type is to grind to a fineness of the order of 1-5 grams residue (100 gm. sample) on a No. 325 mesh sieve. The finer grinding procedure permits application of a more uniform and thinner coating than obtainable with a coarser slip. Because of the tendency to set, as a result of the fine grinding, it is necessary to increase the water content to a point where the milled enamel will have the proper consistency for spraying. In mill batches which require additions of appreciable amounts of refractory materials, Ferro Corporation suggests that a good rule to follow is the use of 55 lb. water for each 100 lb. frit plus refractory material.

The amount of enamel applied to the parts will depend to some extent on the type of service required of the coating. In general, it is highly desirable to limit the coating to the minimum thickness required to give protection and at the same time be practical from the standpoint of application. This optimum thickness has been given as between 0.002 and 0.004 inch. Maintaining a minimum thickness aids materially in avoiding tearing of the bisque coat dur-

to page 74→

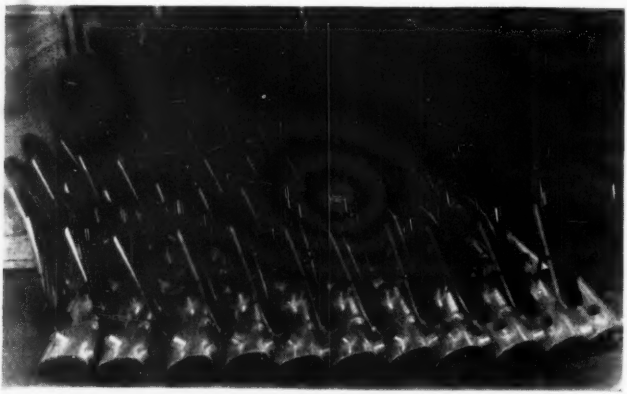

Fig. 6—World War II airplane mufflers coated with heat-resistant porcelain enamel. (*Photo courtesy Ferro Corp., Cleveland 5, Ohio*)

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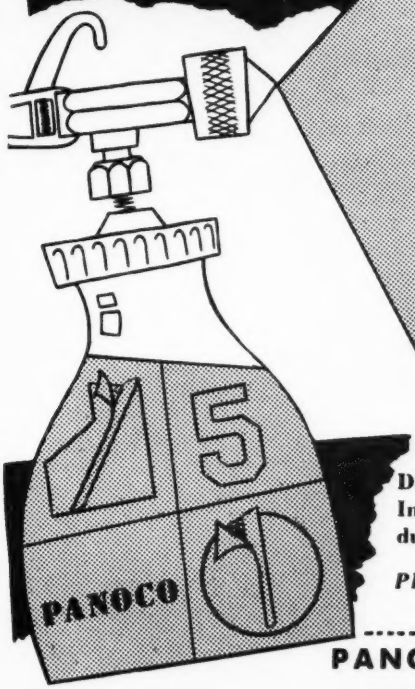

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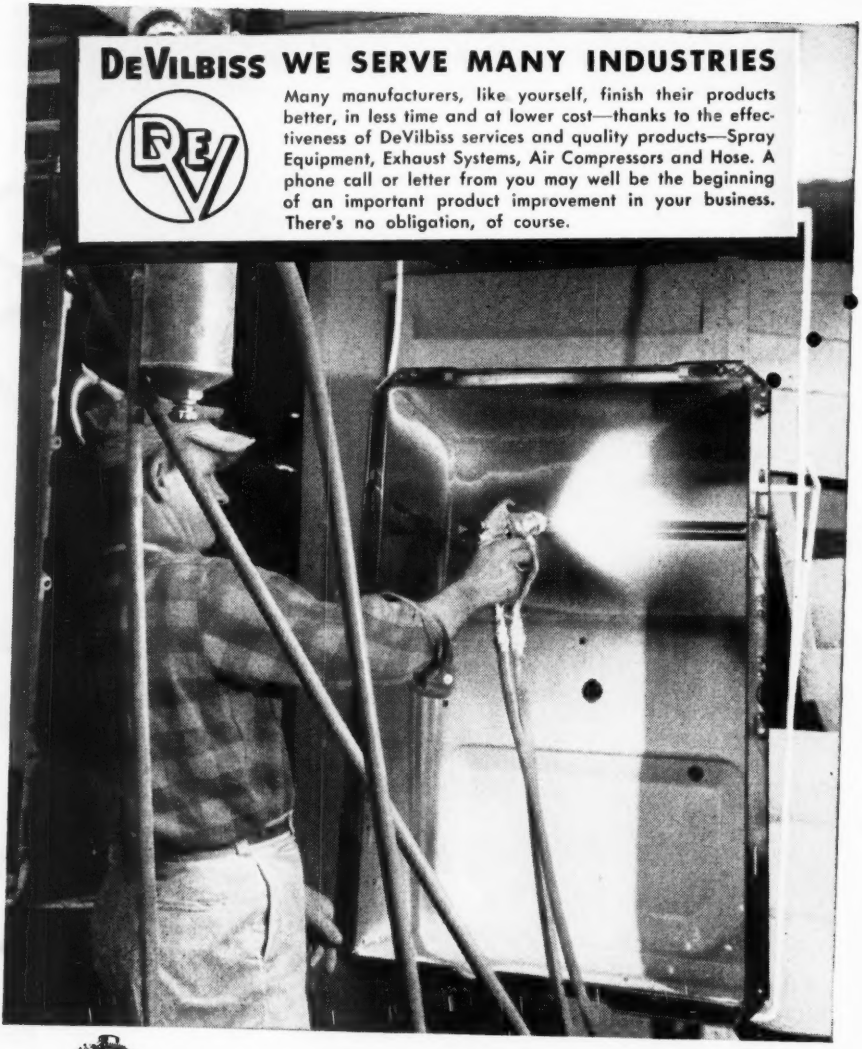

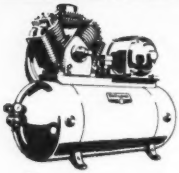

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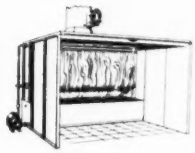

Spray Booths

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ing firing and is of importance from the standpoint of increasing resistance to failure under conditions of thermal shock.

The firing temperature required will depend on the maturing temperature of the coating. Best practice is to fire at the minimum temperature at which maturing of the coating will be achieved within a practical limit of time. A

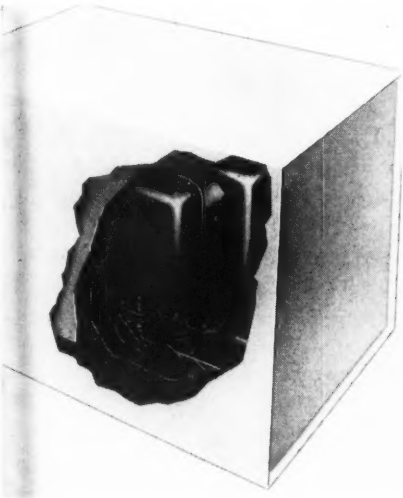

Fig. 7—Heat-resistant porcelain enamel coatings applied to furnace parts such as this prevent scale and corrosion and give increased efficiency. They can replace hard-to-get metals vital to defense production.
(*Photo courtesy Ferro Corp., Cleveland 5, Ohio*)

firing temperature of 1600 deg. F. has been given as the minimum temperature for available coatings of this type. In addition to incurring deformation of the metal by firing at unnecessarily high temperatures, excessive oxidation occurs which may cause "copperheads" and other metal oxidation defects. When coatings are applied to alloy steels, higher enameling temperatures are required to produce adherence of the enamel to the metal. The alloy steels offer greater resistance to deformation at high temperatures than low alloy steels. There is much experimental evidence to indicate that properly selected ceramic coatings will often permit high temperature use of relatively non-critical iron and low carbon steel.

* * *

Coatings by Vacuum Deposition Open Up New Possibilities

HIGH vacuum methods are being used for deposition of thin films of metals on molded plastic items, glass, fabric and sheet material. In some cases vacuum coating techniques have supplanted chemical methods, brush, and spray gun; in other instances they have opened up entirely new fields. Almost invariably, surfaces coated by vacuum deposition have an unusual brilliance. Such surfaces are produced without extra hand finishing or buffing. The texture of the original surface is retained in the final appearance of the product. Millions of novelty items have been vacuum coated.

According to data made available by Distillation Products Industries, manufacturers of high vacuum equipment, surfaces to be coated are arranged in a vacuum chamber to face a common point from which heated material is evaporated. With the number of air molecules reduced many millionfold, the vapor molecules travel without deflecting collisions in straight lines from the source to attach themselves firmly to the coated surface. Any material that retains its solid condition and has a vapor pressure low enough to allow the vacuum system to maintain pressure less than 0.1 micron mercury may be so coated. This includes paper and most plastics. Coating substances now being successfully used include aluminum, copper, gold, Inconel alloy, magnesium fluoride, nickel, silver, zinc, and other metals and alloys.

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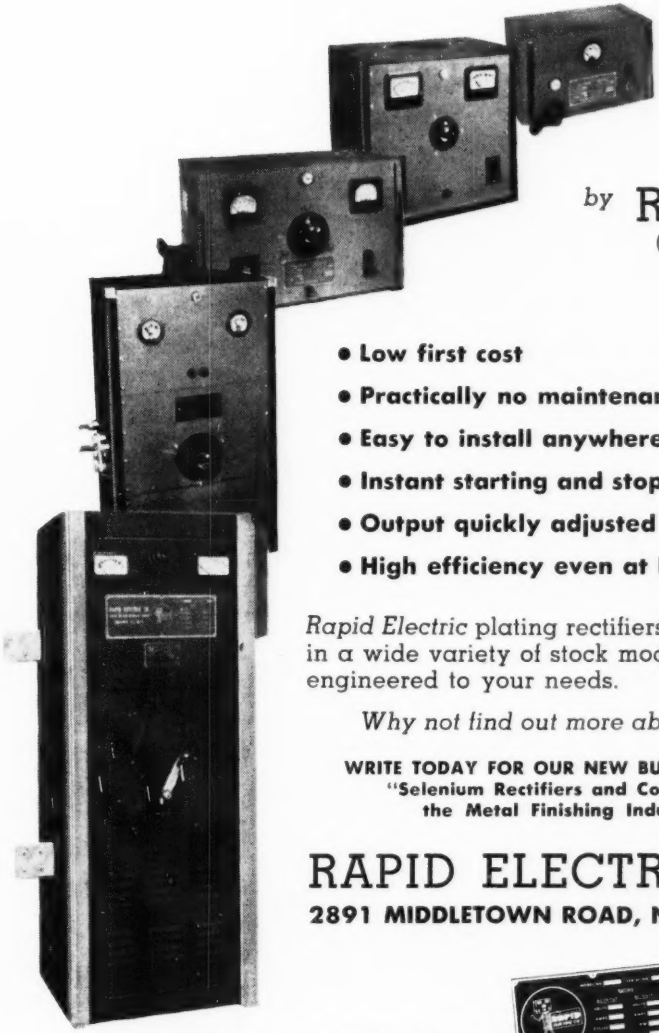

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Black Coating for Stainless Steel

IN some applications where stainless steels are used, reflectivity of the metal part is undesirable. One example is on Garand rifle parts. Simple treatments are available for producing a black oxide coating on stainless steel parts, whether of the straight chromium or nickel-chromium types. In one patented process, stainless parts to be colored are treated in a dichromate bath operated in the temperature range of 720-750 deg. F. Sodium dichromate is generally used. Average immersion time is about ½ hour, depending on the type of steel, size and quantity of the parts being handled. Parts are allowed to cool to room temperature, followed by hot rinsing and drying with an air blast.

In a recent "Materials and Methods" Manual on cleaning and finishing stainless steels it was reported that this black oxide finish stood up well under adverse weather conditions and rough handling. Some users have even reported that the heat and corrosion resistance of the stainless steels are slightly increased through coloring. For some uses the appearance of the blackened surface can be improved by waxing. Blackening baths can be used intermittently. All that is needed in the way of equipment is a steel tank, a heat source for the blackening solution, and baskets or racks for handling the parts.

For further information on any product mentioned in this issue—use the READER SERVICE CARDS between the covers.

HOT Lacquer NEWS

PUBLISHED PERIODICALLY BY HERCULES POWDER COMPANY IN THE INTERESTS OF BETTER FINISHES AND FINISHING

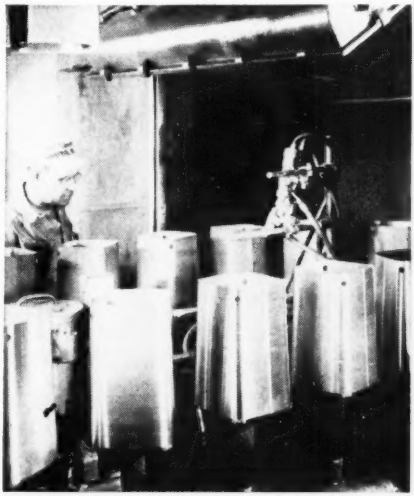
Hot-Spray Lacquer at Air-Way Speeds Normal Drying Cycle

Guesswork Eliminated on Cold Rainy Days

Chief Engineer Boyd of Air-Way Electric Appliance Corporation, Toledo, Ohio, is enthusiastic about the improved results of hot-spray lacquer over the cold lacquer finish formerly used.

One coat of hot lacquer is now sprayed on unprimed aluminum. Then the splatter finish is effected by applying a splatter of solvent. The vacuum cleaner body then passes through a twenty-foot bank of lights and emerges tack-free, *regardless of weather.* Formerly, when cold lacquer was used, the finishing foreman had difficulty on cold, damp days because special thinners had to be formulated so that the coated vacuum cleaner would be tack-free by the end of its normal drying period.

Mr. Boyd adds that Air-Way now gets better "mileage" than formerly for same production schedule, which he attributes in part to lower atomization pressure and resultant less overspray.



Air-Way vacuum cleaner bodies dry uniformly, regardless of weather, now hot-spray lacquer process is used.

NEW MILITARY LACQUER SPEC.

A new military specification for lacquer is now issued and official. Identified as "Military Specification MIL-L-11195 (ORD) Lacquer, Lustreless, Hot Spray (For Ammunition)." Hercules will send you full information on hot lacquer, types of heating equipment available, and the performance record of hot lacquer in many industries.

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PRACTICAL APPLICATIONS of Modern Products

Infra-Red Oven Baking of Painted Auto Heater Parts Results in Even, Tough Finish

MASS production finishing of auto heater parts at the Heater Division, Eaton Manufacturing Company, Cleveland, is accomplished with the aid of a completely conveyorized finishing system. The steel heater parts are carried by an overhead transport through cleaning, paint dipping, paint spraying, and baking operations. The process is so well timed that 2½ hours after parts are hung on the transport conveyor, they are assembled, packed, and ready for shipment.

The finish applied to the heater parts consists of one coat of a gray hammer baking enamel. After application by dip or spray, the finish is baked in the infra-red oven for 3.2 minutes at 300 deg. F. A suitable set-up period prior to baking and a short cooling time after baking are incorporated in the system.

Eaton management rely on the speedy infra-red oven to keep their entire operation smooth-running and efficient. The required even, long-lasting, tough finish is produced by infra-red baking in a relatively short time.

A view of the Fostoria 44-foot infra-red oven used to bake auto heater parts. To keep the oven operating at top efficiency, all lamps are cleaned twice a month with a special solvent to remove any residue that may have settled. (*Photo courtesy The Fostoria Pressed Steel Corp., Fostoria, Ohio*)

Painting Radiator Tubes with Rubber Gasket Material

PAINTING radiator tubes of electrical apparatus at the East Pittsburgh Works of Westinghouse Electric Corporation had been a time-consuming, messy problem. Incomplete coverage of paint resulted, since spray guns lacked the necessary maneuverability to cover the double row of tubes satisfactorily with their spray pattern.

The solution to this problem was found in rubber gasket material. Strips of this rubber gasket are dipped in

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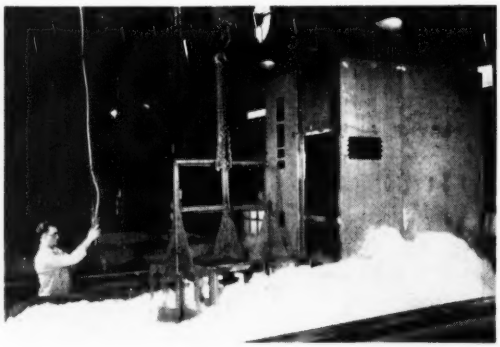
Application of paint to radiator tubes with rubber gasket material.

paint and then used to coat the backs of the radiator tubes.

This process, it is stated, saves paint and time, achieves an even, continuous coat, and saves morale of the worker having to do the job.

Switchgear Bonderized

POWER maintenance cost, longer life, and improved appearance are provided by Bonderizing metal clad switchgear manufactured by the Westinghouse Electric Corporation, East Pittsburgh, Pa. In this plant, circuit breaker frames and metal switchgear housings are dipped in five baths, tanks for these baths having a capacity of 11,000 gallons. The process includes cleaning, rinsing, Bonderizing, rinsing again, and finally a stabilizing bath. The entire process of protecting the metal against rust and corrosion takes about 20 minutes. To preserve the full effectiveness of Bonderizing, a patented rust-resisting treatment, the units are air dried and sprayed with a primer coat. For indoor metal enclosed switchgear, a plastic coating is added for further protection and is not removed until the unit is installed.



Circuit breaker frames and switchgear housings enter the alkaline bath, first of a series of five baths.

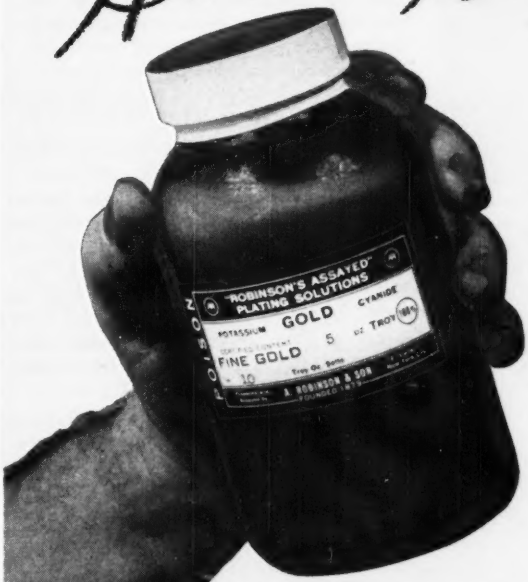
Mass Production Methods of Plastic Plating

AN economical method of plating metal on items molded of Bakelite and Vinylite plastics makes possible lightweight, corrosion-resistant products with hard, high-polish metal surfaces. The mass production method of electroplating developed by Plastiplate Co., Inc., South River, N. J., is performed in barrels made of acid-resistant laminated phenolic plastic. Hardware, jewelry, bottle closures, and shielding for electronic circuits are a few of the items molded of plastics and electroplated with gold, silver, copper,

ROBINSON'S *Assayed* GOLD PLATING SOLUTIONS and SALTS

PALLADIUM · RHODIUM

Held High...



AMONG PRECISION PLATERS EVERYWHERE

Proven for Government Contract Work Where Close Tolerance is Demanded!

ROBINSON has served industry and the jewelry trade for over 72 years and has taken the "experiment" out of precious metal plating, for you, the plater. Make your problem ours — call upon ROBINSON and our complete line of Precious Metals, Solutions and Salts that have been developed and proven for the Electronic, Scientific and Optical Instruments fields, the Jewelry trade, and a host of Industrial Uses. So, always be Specific—Specify ROBINSON!

GOLD SOLUTIONS (LIQUID and SALTS)
Matched Alloys, To Color & Hardness

RHODIUM - SILVER PLATINUM - PALLADIUM
(Solutions, Nitrates, Cyanides)

ANODES, SHEET, WIRE IN ALL PRECIOUS METALS
FULL SCRAP, WASTE REFINING SERVICE

"If it's ROBINSON'S — That's Your Guarantee!"

A. ROBINSON & SON
"70 Years in Precious Metals"
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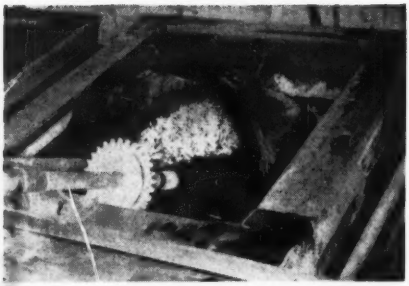
A. ROBINSON & SON, 131 Canal St., N. Y.
Please send information on Robinson's Assayed Gold Plating Solutions ☐, Potassium Gold Cyanide ☐, Rhodium Solutions ☐, Booklet: "Precious Metal Plating" ☐.
Name..... Street.....
City..... State.....



Copper is plated on plastic parts by tumbling inside a perforated barrel.

and other metals. Abrasives are used to roughen the smooth plastic surface so that a thin bond coat of silver will adhere. When dry, the bond coat is tested for electrical conductivity which makes it possible to electroplate objects by tumbling inside a perforated barrel revolving in a copper salt solution. A base coat of copper plate is followed by a thin layer of the desired metal finish. Careful control during the electroplating process ensures uniform metal thickness. The plated parts are then polished by tumbling them in barrels filled with steel shot and soap solution. Larger objects are metal plated in long copper still tanks and polished on buffing wheels. Metal can be plated in twelve colors, as well as two different colors on the inner and outer surfaces of deep molded plastic objects to produce a special inlay effect.

Power Brushes Do Two Jobs

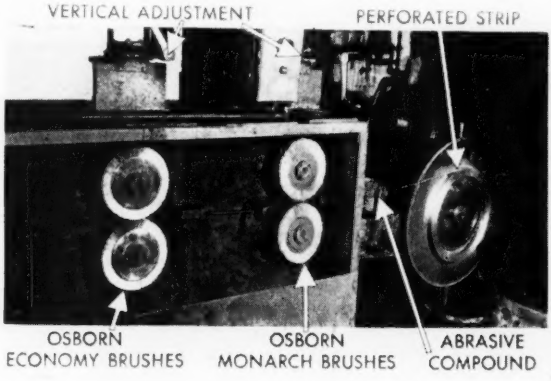
BY combining two individual production processes into one automatic brushing operation, manufacturers of cutting tools are saving money and, in addition, are obtaining higher quality finishes.

The two jobs done by the power brushes, manufactured by the Osborn Manufacturing Company, Cleveland, Ohio, are: removing heat treat scale and preparing the strip surface for name etching.

These two operations, formerly done by machines having six brushing heads, have now been reduced to a two-station automatic machine that does both operations simultaneously.

The cutting tool strip is pulled through the Osborn brushes at 50 feet per minute and comes out uniformly clean and micro-smooth, ready for name etching. The brushes rotate at 3450 revolutions per minute. As they become grooved from wear, they are reversed. Bevel gears move the brushes up or down as required.

This new brushing method resulting in considerable savings, came about as a result of the extensive engineering application program carried on by the Osborn Manufacturing Company.



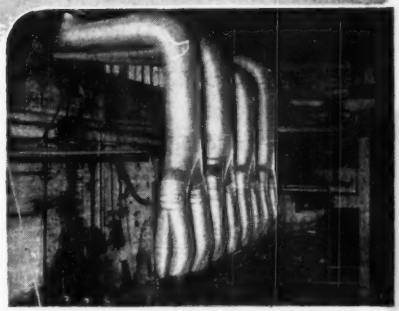
Automatic Brushing Machine for cleaning and finishing hardened high-carbon steel razor blade strip. Brushes rotate at 3450 revolutions per minute, finishing strip for hundreds of thousands of blades every day.

Ohio FUME AND DUST REMOVAL SYSTEMS
TANGIBLE DOLLAR SAVERS

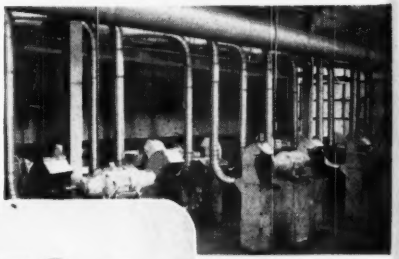
● Records on hundreds of Ohio Blow Pipe jobs prove without question that production output materially increased and employee absence and complaints radically decreased after the installation of an Ohio System for ventilation of fumes from plating and rinse tanks and dust collection from grinding, polishing and buffing.

Ohio Systems are not standard fit-all systems. They are designed and engineered to meet your individual requirements. Ohio engineers, thoroughly experienced in their field, make a careful, exacting survey of your plant and an analysis of conditions and then plan the system that will meet most efficiently your special needs and conditions.

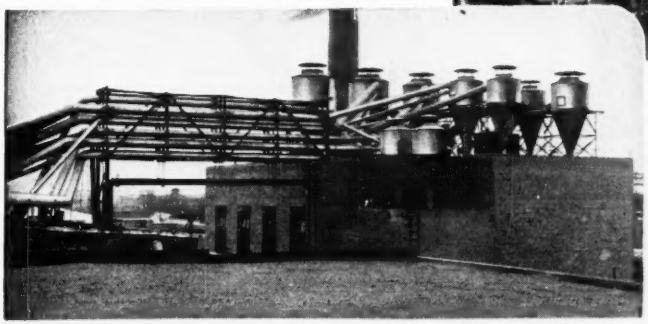
Call, write or phone today and let Ohio engineers make a survey and give you, without obligation, an estimate.



Fumes Removal Installation in Plating Room



Dust Collecting System for Buffing Machines



Cyclone Type Dust Collectors

Write today for free illustrated color folder showing you how an "Ohio" system protects your profits.

Ohio BLOW PIPE CO.
ENGINEERS AND MANUFACTURERS
1725 DOAN AVENUE • CLEVELAND 12, OHIO

NEWS of the Industry

COMPANIES

TOUSEY VARNISH COMPANY has announced an addition to its laboratory facilities in the plant at 520 W. 25th Street, Chicago. Occupying a 20 x 60-foot area, the new laboratory doubles the capacity of the company's Development and Research Divisions. Each of these departments is fully equipped with spray booths, grinding mills and mixers, temperature ovens, and other necessary equipment for developing new products.

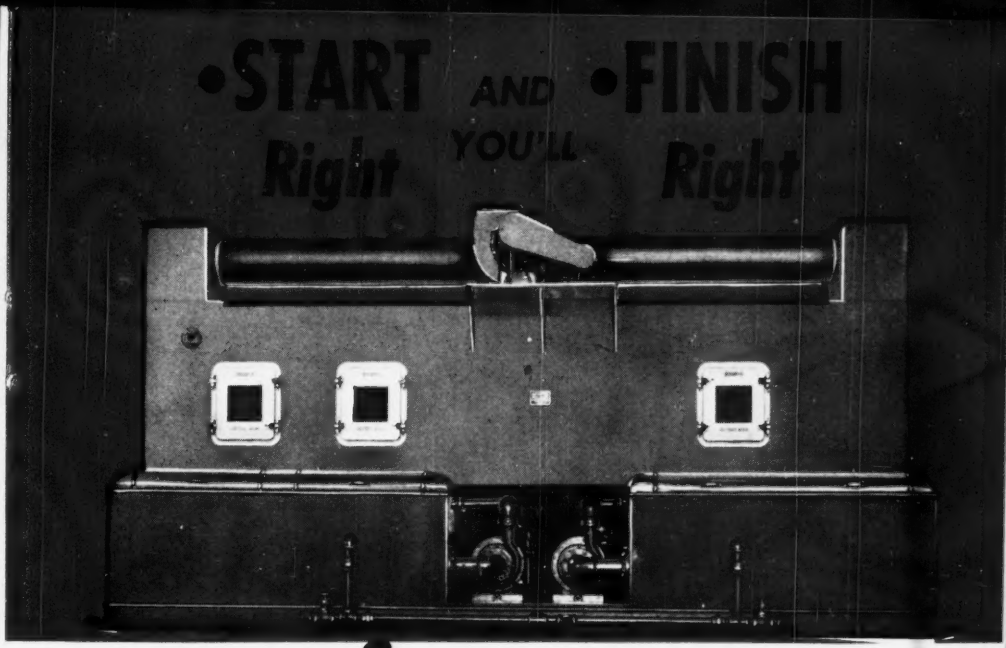
Tousey also has a Product Evaluation Laboratory that contains such machines as salt spray and humidity cabinets, weatherometer, abraser, gloss meter, dry recording machine, and many other types of equipment to test resistance and durability of finish films.

In the Raw Material Control Laboratories basic materials are tested and results carefully recorded.

With the new capacity, Tousey can offer its customers and prospective customers a complete service of analysis and recommendation, as well as immediate action on sample requirements.

TOPPER EQUIPMENT COMPANY of Matawan, New Jersey, has announced the purchase of Optimus Equipment Com-

New Laboratory Facilities of the Tousey Varnish Company



Schmieg CENTRI MERGE WASHERS

FIRST *Step* • FIRST *Choice* • *In* FINISHING

You start right when you call upon Schmieg engineers for mechanical washers to fit your specific production requirements. And that's why you finish right, too. Because Schmieg washers are designed and engineered to give you high production cleaning, long trouble-free performance at low operating cost.

There's a Schmieg washer for any kind of job, a washer that will save floor space and can probably be loaded and unloaded by one man. Available in manual and automatically loaded types.

Convenience is emphasized in Schmieg washers, no matter what type—convenient controls, variable speed drives, doors that permit quick access to interiors for ease of maintenance.

No wonder Schmieg washers are first step and first choice in finishing!

Start right now by consulting Schmieg engineers for your washing requirements.

THE *best* AIR PURGE *is* CENTRI MERGE

Schmieg INDUSTRIES INC.
Engineers & Manufacturers

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pany patents, trade marks, manufacturing rights, sales rights, engineering, drawings, as well as certain inventory and machinery pertaining to the vapor degreasing business. This will include industrial vapor degreasers as well as automotive degreasers sold under the trade name of Circo.

The Optimus Equipment Company has discontinued operations and will be dissolved. The company will occupy the same premises as did the Optimus Equipment Company, and most of the same personnel will be retained, according to Melville Morris, president.

PLATERS SUPPLY COMPANY, INC., has announced that it is now occupying a new building at 2311 Valley Ave., Indianapolis, Ind., as a result of progressive development and expansion. Ample room for storing many items of plating and polishing supplies has been provided.

Edward Bruck, president, and Robert Bruck, secretary-treasurer of the company, are officers of the Indianapolis Branch of the A.E.S.

The second in a series of clinics on finishing developments and problems was recently conducted in Lancaster, Pennsylvania, by the **MAAS & WALDSTEIN COMPANY**, Newark, Chicago, and Los Angeles, manufacturer of industrial finishes.

According to B. F. Ames, general sales manager, it is the intention of the company to hold similar clinics in other key marketing centers across the country as its contribution to the technological advancement of the finishing industry. Mr. Ames' paper was based on the use of organic coatings during the national emergency.

The accompanying photograph, taken recently in one of the sales rooms of MIYATA WORKS, LTD., Tokyo, Japan, was made upon the occasion of the visit to the plant of Ezra A. Blount, editor of PRODUCTS FINISHING, currently serving a tour of duty with the U. S. Air Force in Japan, as Officer-in-charge of the Industrial Section of FEAMCOM. Shown in the photo are: (left to right) M. Watanabe, sales department; K. Yamashita, plant manager and managing director; Lt. Col. Blount; Masahiko Miyata, asst. technical director; T. Okazaki, plating foreman; and T. Miyajima, plating research manager. Mr. Yamashita, together with four other representatives of the bicycle industry of Japan, is currently engaged in a trip to England and the United States to study manufacturing and finishing methods as they apply to the bicycle industry.

Shown on the map of Japan in the left background are the locations of the several plants of MIYATA WORKS, LTD., one of Japan's leading bicycle and motorcycle manufacturers. (*PRODUCTS FINISHING Staff Photo*)

Look into this mirror for faster production

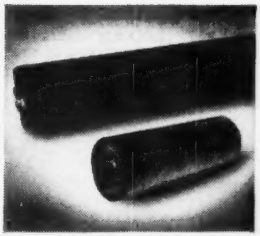
A brushing method used by a mirror manufacturer . . . or one similar to this . . . may help you improve product quality and cut rejects.

To provide a binder for the silvering compound, a base coat was formerly applied to the glass by hand. But uneven coating caused blemishes in the silver after drying. With the help of the **O**sborn **B**rushing **A**nalyst, a power brushing method with specially-engineered Osborn Heli-Master® Brushes was développed (1) to clean the glass thoroughly with water and (2) to *brush on* the base coat in a perfectly uniform film. Results: Blemishes in silvering practically eliminated. Mirror production has been stepped up and rejects cut to the bone.

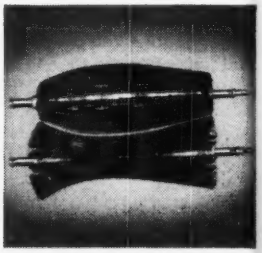
Look into the possibilities of power brushing for the improving of *your* manufacturing . . . whether it involves glass, metal, rubber, plastics or textiles. To get the help of an **OBA**, call or write *The Osborn Manufacturing Company, Dept. 585, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

OSBORN

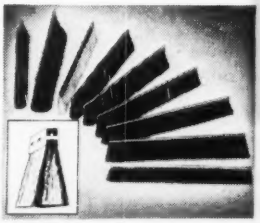
LOOK FOR THE NAME OSBORN . . . RECOGNIZED EVERYWHERE FOR QUALITY WORKMANSHIP AND MATERIALS



FOR HIGH SPEEDS. Osborn Heli-Master® "FA" Brushes provide a continuous, uniform density of fill up to a 180° brush face length. These can be built for many types of cleaning, scrubbing and finishing for smooth operation at speeds up to and exceeding 10,000 surface feet per minute. In wide range of fill materials for metallic and non-metallic materials.



FOR FLEXIBILITY. Osborn Rota-Master® Brushes may be used for wide-face applications such as glass washing, cleaning and unloading conveyor belts, wood staining, bus washing, rubber roughing, power sweepers. Open face design affords flexibility. Density is regulated by the number of Master strips employed.



FOR MANY JOBS . . . Osborn Master® Strip Brushes can be used in special mountings for a wide variety of power-driven applications—in straight strips or wound on an arbor as for the Heli-Master or Rota-Master Brushes. Have the **O**sborn **B**rushing **A**nalyst show you how these versatile brushes can help solve *your* problems.

®Trademark

Officials who presided at the M & W finishing clinic in Lancaster, Pennsylvania, are (left to right) D. P. Volino, William Fordney, Sr. (vice president, Lancaster Branch A.E.S.), B. F. Ames, J. Edward Bemiller (president, Lancaster Branch A.E.S.), R. S. Benjamin.

R. S. Benjamin, one of the M & W sales engineers in the Philadelphia territory, discussed the subject of electrostatic spraying of finishes, its field of usefulness, and its limitations, as well as the care and handling of spray equipment.

D. P. Volino, representative in the York-Lancaster area, served as host at the meeting, which 45 engineers, chemists, electroplaters, and representatives of top management in industry attended.

To ensure prompt delivery for the increasing demand for Sel-Rex Selenium Rectifiers, **BART-MESSING CORPORATION** has enlarged its manufacturing facilities at Belleville, New Jersey. International distribution and exclusive developments have been prime factors in the heavy demand.

The new area will provide for more assembling and testing space.

"Planned Care Means Longer Belt Wear" is the theme of a conveyor belt maintenance program currently being conducted by **THE CAMBRIDGE WIRE CLOTH CO.** Cambridge, Md., which is aimed at better maintenance of woven wire conveyor belts in high temperature installations to stretch belt life during the current period of metal shortages.

The program combines intensive field work by the Cambridge staff of sales engineers with a series of mailings to users of woven wire conveyor belts. Each mailing contains general data on woven wire

Enlarged plant of the Bart-Messing Corporation

a Labor Saving, Money Saving Idea!

CONTINUOUS STRIPPING

OF HOOKS, HANGERS, with REJECTS

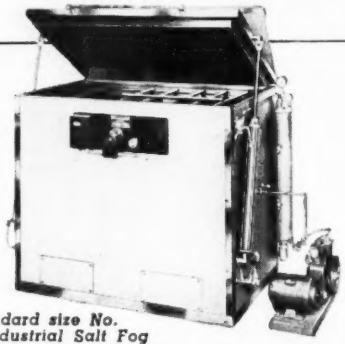
KLEM *Strip-Aid*

Patent applied for

YES for a cleaner, better finish, strip hooks and hangers of paint and enamel before reusing. Do it at a saving of labor and material. Do it as an operation on your regular paint line. Get the facts of Klem's new additive Strip-Aid that makes continuous stripping possible by cutting time and material costs in half on most stripping operations.

KLEM *Chemicals* 14401 LANSON · DEARBORN, MICH.

ACCEPTED
Salt Fog
CORROSION TEST UNITS
BY INDUSTRIAL



Standard size No. 1 Industrial Salt Fog Testing Cabinet. Larger sizes are engineered to suit requirements.

for over-all economy . . .

You have nothing to lose—and much to gain—when you make salt fog tests in an INDUSTRIAL cabinet. These cabinets are built to meet A.S.T.M. B-117-44T salt spray test, also Army, Navy, and Air Force standards.

Consider these features:

- Lucite nozzle with fixed orifice that does not corrode or clog.
- Rubber-lined box for protection against corrosion.
- Accurately controlled enclosed heating
- Fully insulated for heat economy.
- Air by-pass valve to clear cabinet before inspection of specimen.
- Exhaust flange at rear.
- Air compressor with oil filter. (Cabinet can be connected to other air dryer.)
- Air-operated cover lifter (extra).

INDUSTRIAL FILTER & PUMP MFG. CO.

5904 Ogden Ave., Chicago 50, Illinois

conveyor belts plus a specially prepared "Belt Hint" on one or another phase of belt maintenance.

FERRO CORP., Cleveland, Ohio is again sponsoring a Student Contest in Porcelain Enameling. The contest, awarding prizes totaling $1,000, is open to all students, graduate and undergraduate in ceramic schools in the United States. Prizes will be awarded for the best papers dealing with porcelain enamel technology, and awards will be made at the 54th Annual Meeting of The American Ceramic Society, which will be held at the William Penn Hotel, Pittsburgh, Pennsylvania, April 27-May 1, 1952.

The judges will be Charles S. Pearce, secretary, The American Ceramic Society; Edward Mackasek, managing director, Porcelain Enamel Institute, Inc.; and B. J. Sweo, director of Ceramic Research, Ferro Corporation.

AMERICAN CHEMICAL PAINT CO., Ambler, Pa., has announced that it has recently undertaken a research program under contract with the Office of the Quartermaster General, Washington, D. C.

The scope of the program will be the investigation and development of prepaint treatments and final chemical treatments of metal surfaces, for the protective finishing of designed Quartermaster articles of supply. The items to be studied include metal containers and equipment hardware.

ALLIED RESEARCH PRODUCTS, INC., Baltimore, Md., has announced the establishment of two subsidiary companies.

The first, Allied Metal Finishing Corporation, will assume responsibility for the job shop metal finishing business previously conducted by the parent organization. Offices will be maintained at the same address, and the sales and service staff will remain the same.

The second subsidiary is the Allied Research Sales Corporation and was established to handle the national sales of the Iridite metal finishes and ARP plating chemicals. These compounds will continue to be manufactured by the parent company, who will also engage in a continuing program of new product research.

There is only *one* PENTRATE . . . the oldest name in black oxide finishing. Since 1923, it has stood as the leader in uniformity, dependability and quality. Discerning metal finishers have used over *twelve million* pounds. This label is your assurance of reliability and continuous research for an even better product — insist on it!

Pentrate meets U. S. Gov. Spec. 57-0-2, Type III, Class A.

HEATBATH CORPORATION

•

SPRINGFIELD 1, MASSACHUSETTS

Formation of a plating firm in Chicago to be known as the **METRO ELECTRO PROCESSING CORPORATION** was announced by Gus G. Sutter, newly-elected president. Other officers of the firm are Tom W. Graff, vice president, and Sam Yokely, secretary-treasurer.

Mr. Sutter is also president of the Pioneer Plating Company and has been associated with the plating business for the past ten years. Mr. Yokely was a former partner in the firm of Clybourn Polishing Company for six years.

Metro Electro Processing will be the exclusive licensee in the Midwest area of a new process known as "Electrofilm Process," of California.

In order to better serve America's expanding manufacturing program, now stimulated by defense needs, the **UNITED LACQUER MANUFACTURING CORP.**, Linden, N. J., will triple its research facilities, it was announced. The firm's research expansion will be accomplished by the construction of a laboratory building and by taking over an area in an existing factory building now used for other purposes.

In addition to conducting general research and formulation of new materials, United Lacquer makes its facilities available for solving customers' specific finishing problems.

Finding its once luxurious offices no longer adequate to cope with its 100 years of growth and progress, **AMERICAN HARD RUBBER COMPANY** has left the offices it has occupied for 72 years on Mercer Street in downtown Manhattan, and moved to modern, efficient offices at 93 Worth Street, New York 13, New York.

Now producing a wide variety of industrial and consumer products, including large rubber-lined tanks, American Hard Rubber Company is celebrating its 100th anniversary this year.

HOUGHTON LABORATORIES, INC., Olean, N. Y., has started production of a broad line of plastisols and organosols. To make this possible, production facilities at both the Olean, New York and

PARAMOUNT BRAND

FELT WHEELS

...TOPS IN "Contourability"

Are you finishing articles which require a wheel with a "shaped" or contoured face? Don't forget that felt wheels lend themselves to contouring probably better than any other type of wheel. Don't forget, too, you have nine degrees of hardness to choose from when you buy Bacon Felt Wheels—The Paramount Brand. Ask your supply house for Paramount Brand Felt Polish Wheels.

Send for Our New Catalog

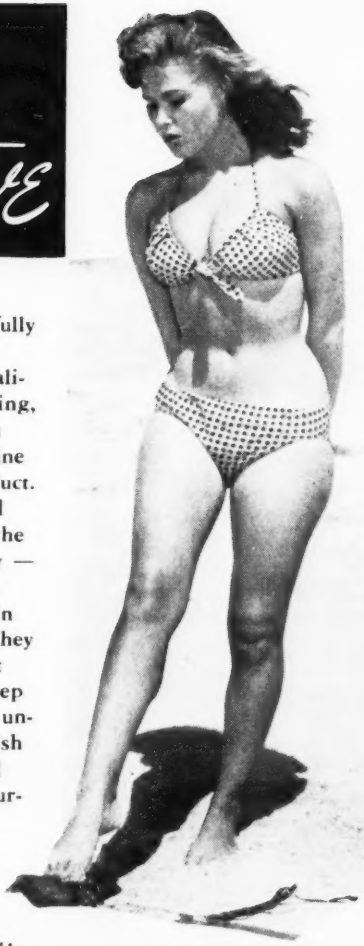
BACON FELT COMPANY

Established 1825

TAUNTON "America's Oldest Felt Manufacturer" MASSACHUSETTS "Felt Does It Better"

Your Supply House can Furnish Bacon PARAMOUNT BRAND FELT BOBS & WHEELS

Attractive



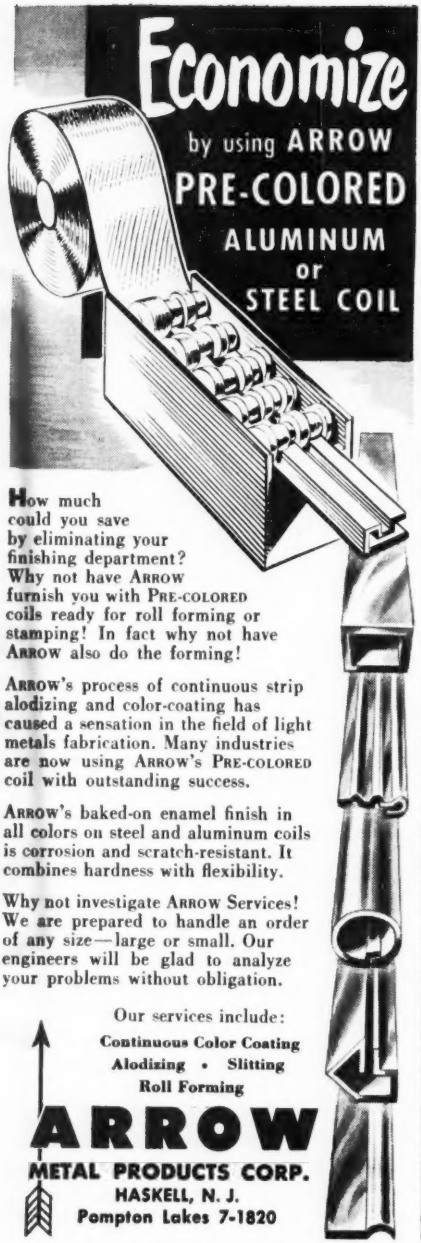
Distinctive finishes — skillfully prepared in our Creative Studio — have attracting qualities, too! They are eye-catching, sales-motivating coatings which subtly enhance the fine lines and design of any product. Our capable, highly-trained artists — men who realize the importance of individuality — have the know-how and experience so necessary in developing such finishes. They are never satisfied with "just about perfect" . . . they keep working on an assignment until they have conceived a finish that is destined to do a real sales-winning job. Avail yourself of their creative abilities.

No Tampering with Quality

ROCKFORD VARNISH *Company*

ROCKFORD, ILLINOIS

Manufacturers of Protective and Decorative Coatings



How much could you save by eliminating your finishing department? Why not have ARROW furnish you with PRE-COLORED coils ready for roll forming or stamping! In fact why not have ARROW also do the forming!

ARROW's process of continuous strip alodizing and color-coating has caused a sensation in the field of light metals fabrication. Many industries are now using ARROW's PRE-COLORED coil with outstanding success.

ARROW's baked-on enamel finish in all colors on steel and aluminum coils is corrosion and scratch-resistant. It combines hardness with flexibility.

Why not investigate ARROW Services! We are prepared to handle an order of any size—large or small. Our engineers will be glad to analyze your problems without obligation.

Our services include:
Continuous Color Coating
Alodizing • Slitting
Roll Forming

ARROW
METAL PRODUCTS CORP.
HASKELL, N. J.
Pompton Lakes 7-1820

Smethport, Pennsylvania plants have been expanded considerably. The company expects to be able to supply both civilian and military requirements for these materials, according to Russell M. Houghton, president.

Marketed under the trade name Hysol, the plastisols and organosols are used as coatings for coils, bus bars, paper and staple fibers; also for coating electroplating racks and tanks, dipping baskets, ducting, and pipe.

In addition to this line, Houghton Laboratories will continue to produce corrosion-resistant protective coatings; concrete enamels; marine anti-fouling and salt water resistant coating systems.

Pennsylvania Lacquer Center, 145 N. Fourth St., Philadelphia 6, Pa., has announced the return of **SERGEANT NICK MILICIA.** With the U. S. Marines in Korea for the last six months, he will resume his position as industrial finishes sales manager.

The company, manufacturer of the Wonder-Lac lacquers and synthetics, has a large plant in Haddonfield, New Jersey, which comprises approximately 55,000 square feet.

GRIEVE-HENDRY CO., INC., 1101 N. Paulina St., Chicago 22, Ill., manufacturer of industrial portable electric ovens, has announced the appointment of L. H. Butcher Company, San Francisco, Portland, Seattle, and Salt Lake City, as its West Coast distributor to the plating and related metal finishing industries.

NEW POSITIONS

T. H. Wickenden, vice president in charge of the Development and Research Division of The International Nickel Company, Inc., has announced the transfer of **R. B. KROPF** from the company's Cincinnati Technical Section to the Detroit section where he will assist in the expanding defense activities of that area. **C. T. HALLER,** formerly of the company's Pittsburgh Technical Section, has been placed in charge of the Cincinnati section.

Mr. Kropf, who has been in charge of Inco's Cincinnati Technical Section since its inauguration in 1945, is a graduate of Michigan College of Mining and Technology and the University of Wisconsin.

Mr. Haller graduated from the Car-

Easier, smoother break-in, longer subsequent wear

Get over the hump of break-in with the friction parts of an engine and you've got a big trouble-source eliminated. And that's one thing Parco Lubrite does—it prevents scuffing and scoring during break-in operation. The Parco Lubrite coating, non-metallic and integral with the metal, is oil-absorbent and maintains lubricant in the tight fit of new parts and so assures easy and smooth operation.

The Parco Lubrite coating promotes longer subsequent service because the parts wear in easily to close mating of parts and bearing surfaces.

Treatment of parts with Parco Lubrite is a chemical process which produces results of uniform, high quality and operates with simplicity and efficiency.

For full information about Parco Lubrite, write for free technical bulletin.

* *Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.*

Parker *RUST PROOF COMPANY*

2172 E. Milwaukee Ave
Detroit 11, Michigan

BONDERITE—corrosion resistant paint base • **BONDERITE and BONDERLUBE**—aids in cold forming of metals • **PARCO COMPOUND**—rust resistant • **PARCO LUBRITE**—wear resistant for friction surfaces

negie Institute of Technology in 1939 and joined the company's Pittsburgh Technical Section in January 1945.

American-Marietta Company, has announced that **R. H. McCORMAC** has joined the organization as assistant to Vice President Robert E. Pflaumer who has charge of the company's expanding resin and chemical operations.

R. H. McCormac

Mr. McCormac recently returned to the United States from Buenos Aires after disposing of his interest in Resinas Argentinas, an alkyd resin manufacturing business which he formed in 1946. Resinas Argentinas built and operated Argentina's first plant devoted exclusively to alkyd resins.

For ten years he was asociated with the laboratories of Sherwin-Williams in Chicago and later, for seven years, directed the Sherwin-Williams manufacturing operations in Argentina.

THEODOR D. MEYER, formerly superintendent of Australian Abrasives Pty., Ltd., a Norton associate company in Auburn, New South Wales, Australia, was appointed production engineer of the Abrasive and Wheel Division, Norton Behr-Manning Overseas, Incorporated, according to an announcement made by Herbert A. Stanton, president of the newly-formed company.

Mr. Meyer will be responsible for technical manufacturing matters related to foreign plants.

The Porcelain Enamel Institute has re-elected its incumbent president, **R. A. DADISMAN** of Armco Steel Corporation, for his second term. Previously he has served as vice president, a member of the board of trustees and the Executive Committee, and as chairman of the Market Development Committee.

A Strippable Plastic for the Protection of Metals

Striplastic is a protective plastic applied by spraying, dipping or rolling. It is used on stainless steels, high polished metal sheets, sheets in cold working or drawing, tools, dies and parts, and on sheets or metal parts before packaging. It protects against scratching and abrasion, and against rust. Also available as a booth coat protection.

THE STRIPLASTIC COMPANY

Among many advantages, it is non-toxic, possesses great tensile strength and is easily stripped off in one piece. Write for complete information on this new strippable plastic.

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CLEVELAND 6, OHIO

To the many users of
Abbott Tumbling Barrels and Abbott *deep hardened,* carbon steel Burnishing Materials
we send this wish: — May your holiday season
be as bright as the products you finish with
our Burnishing Shapes.

May we serve and help you in the years to come?

ABBOTT

THE ABBOTT BALL COMPANY
1064 NEW BRITAIN AVE.
HARTFORD, CONN., U.S.A.

Two new vice presidents were elected: **E. O. BRADY,** Briggs Manufacturing Company, and **ROBERT C. MYERS,** U. S. Steel Company. **W. A. BARROWS,** Barrows Porcelain Enameling Company, and **HAROLD H. WINEBURGH,** Texlite, Inc., were re-elected. **P. B. McBRIDE,** Porcelain Metals Corporation, was re-elected treasurer.

Named to the post of secretary of the Institute was **JOHN C. OLIVER,** who had previously been assistant managing director. **EDWARD MACKASEK,** managing director, retained his title but has been released from a number of administrative duties to enlarge his liaison work with Government bureaus.

C. B. Gracely (left), D. V. Perry

D. V. PERRY, Eastern district manager of The DeVilbiss Company, has been named to the position of assistant sales manager of the company's spray painting and finishing division, it was announced by H. M. Kidd, sales manager. **C. B. GRACELY,** manager of the DeVilbiss office at Houston, has been promoted to the post of Eastern district manager.

Mr. Perry's office will be at the company's main plant in Toledo. Mr. Gracely will have his office at the company's branch in Newark, New Jersey. He will supervise sales activities in the New England States, New York, New Jersey, Delaware, Maryland, the eastern part of Pennsylvania, and a large section of Virginia.

Both men are veterans in the DeVilbiss spray painting and finishing equipment sales division, and have a wide knowledge of trade requirements.

YOU
can *rely* on
RANDOLPH
for prompt shipment
in any quantity of
Performance - Proved
Government Specification
FINISHES

Lacquers • Enamels • Dopes • Thinners
Clear Metal Finishes • Colored Lacquers
Clear S.G. for Metal • Texture Enamels
Specialized Production Finishes
Aircraft Finishes

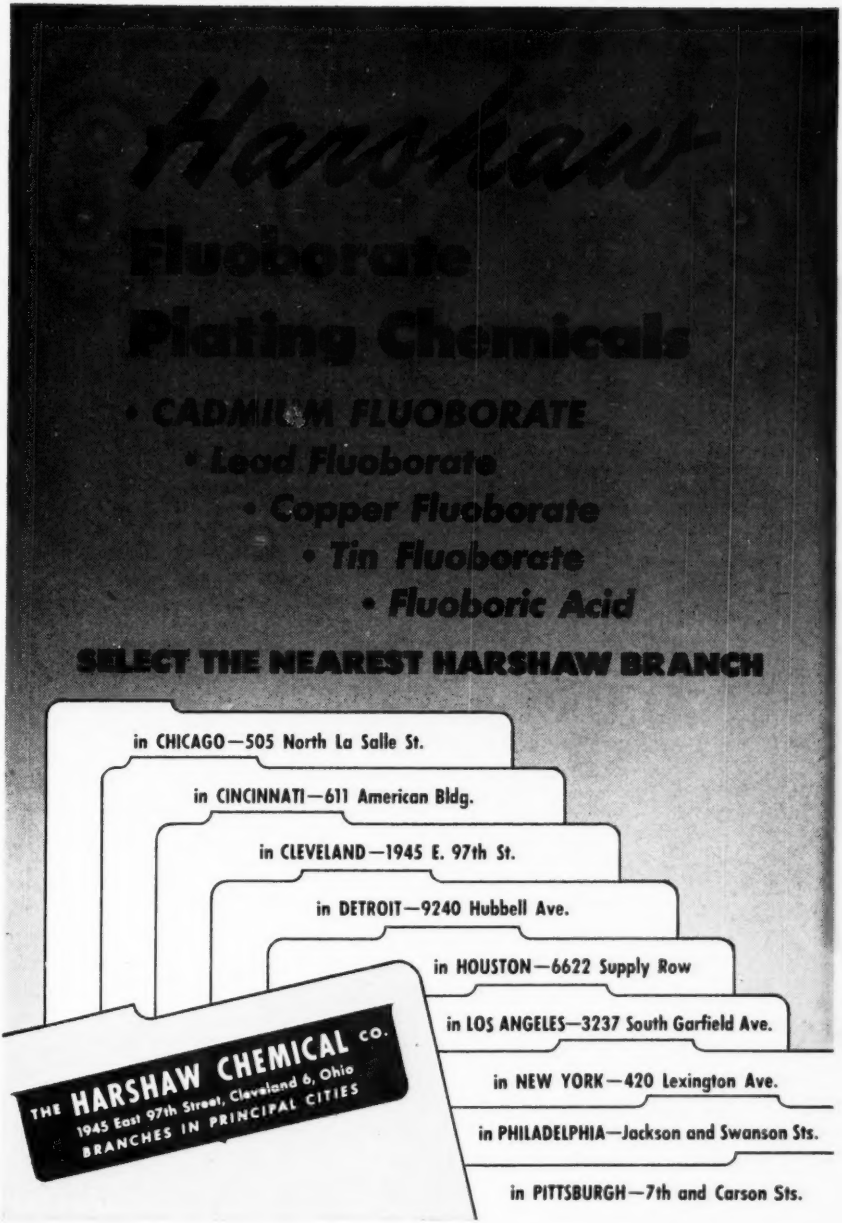
RANDOLPH
PRODUCTS CO.
CARLSTADT, NEW JERSEY

DONALD ROBERTS has joined the sales force of the Maas & Waldstein Co., Newark, N. J., according to an announcement by G. Klinkenstein, president.

As a technical service field representative, Mr. Roberts has been assigned to cover a large section of the Metropolitan New York area. He is experienced in the field of specialized production finishes and has completed a training course in the company's research and development laboratories and pilot plant.

Donald Roberts

Appointment of **ARCHIE K. BEARD** as Midwest sales manager of Turco Products, Inc., was announced recently by President S. G. Thornbury. **HAROLD P. GLAVIN** has been named to the post of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Fluoborate
Plating Chemicals
• CADMIUM FLUOBORATE
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• Copper Fluoborate
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SELECT THE NEAREST HARSHAW BRANCH
in CHICAGO—505 North La Salle St.
in CINCINNATI—611 American Bldg.
in CLEVELAND—1945 E. 97th St.
in DETROIT—9240 Hubbell Ave.
in HOUSTON—6622 Supply Row
in LOS ANGELES—3237 South Garfield Ave.
in NEW YORK—420 Lexington Ave.
in PHILADELPHIA—Jackson and Swanson Sts.
in PITTSBURGH—7th and Carson Sts.
THE HARSHAW CHEMICAL CO.
1945 East 97th Street, Cleveland 6, Ohio
BRANCHES IN PRINCIPAL CITIES

Harold P. Glavin (left), Archie K. Beard

general manager, Midwest division factory, with headquarters in Rockdale, Illinois.

Mr. Beard, formerly Turco's district manager in Cleveland, has been transferred to Chicago, where the organization's Chicago-Cleveland operation will now be consolidated. He joined Turco as a technical service engineer in September 1945, and assumed the Cleveland district managership in January 1948. A graduate chemical engineer from Arizona State College and the University of Southern California, he was supervisor of the chemical and metallurgical laboratory for Goodyear Aircraft during the war.

Mr. Glavin, for the past year office manager of the Los Angeles business office, will coordinate factory and office operations in the Midwest division.

The appointment of **WILLIAM N. NOBLE** to the position of assistant to the president was announced by C. D. Clawson, president of the Ferro Corp., Cleveland, Ohio.

A graduate of the University of Illinois with a B. S. degree in ceramic engineering, Mr. Noble first joined Ferro in 1933 as a member of the laboratory staff. He served in research and development capacities until 1947, when he was made manager of the Frit Division.

Together with Mr. Noble's appointment, Mr. Clawson announced the promotion of **J. H. GINTHER** to assistant to the executive vice president. As assistant to F.

DON'T WASTE LABOR

SCRAPING DOWN SPRAY-BOOTHS

USE LIQUID ENVELOPE

PEELABLE SPRAY-BOOTH COATING

Using expensive labor to scrape down spray-booths costs a lot more than peeling off accumulated overspray in big sheets. Safer, too. Order a 5-gallon Test-Sample at Drum Lot price.

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R. W. Renton Co., Cleveland, Ohio, Indianapolis, Ind.
Dean & Barry Co., Columbus, Ohio
Vic Miner Co., Toledo, Ohio
Abrasive & Supply Co., Detroit, Mich.
Melson Industrial Supply Corp., Grand Rapids, Mich.
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Paints & Lacquers, Inc., Chicago, Ill.
Tanner & Co., Indianapolis, Ind.
Metal Goods Corp., St. Louis, Mo., North Kansas City, Mo., Dallas, Texas, New Orleans, La.
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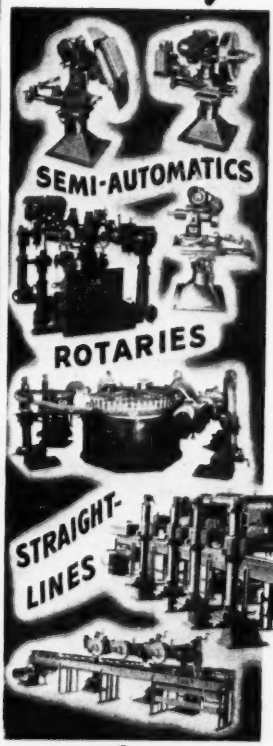
ACME *Automatic Polishing and Buffing Machines*



• *Which ACME Automatic will give YOU lowest cost production?*

It depends . . . on the size, shape and material of the part you want to finish; on production required; on plant space and layout. ACME Automatics include Straightlines, Indexing and Continuous Rotaries, with or without spindles. These machines are built in a variety of types and sizes and may be equipped with varied special fixtures and accessory equipment to meet the conditions involved in your specific job. ACME Automatics have proved their efficiency in production for nearly half a century. Progressive ACME experience in this specialized field is a substantial assurance of lower production cost and dependability under production operation in your plant.

Catalogs on Request

ROTARY STRAIGHT LINE SEMI-AUTOMATIC AND SPECIAL *Polishing and Buffing Machinery*

SPECIAL MACHINERY — AUTOMATIC BUFFING MACHINES

ACME *Manufacturing Co.*

1400 E. 9 MILE RD., DETROIT 20 (Ferndale) MICH.

Builders OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR NEARLY HALF A CENTURY

William N. Noble (left), J. H. Ginther

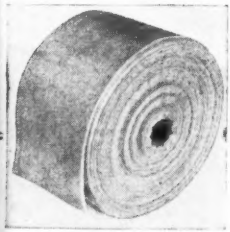
James A. Moody (left), William O. Hall

S. Market. Mr. Ginther will be charged with the direction of manufacturing operations of the corporation, including divisions outside Cleveland.

Mr. Ginther came to Ferro from the University of Illinois, where he graduated in ceramic engineering in 1937. After the war he returned to the company and joined the engineering department of the International Division, being assigned to the Ferro Mexican subsidiary in 1947.

The appointments of **JAMES A. MOODY** to material control manager and **WILLIAM O. HALL** to chief project and test engineer are two promotions at the C. A. Norgren Co., Denver, Colo., announced by C. Neil Norgren, assistant general manager.

Mr. Moody will be responsible for keeping Norgren operations in conformance with Government restrictions and regulations covering various materials. Mr.



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Cut off any size piece and use as needed.

CUT BULK
Already cut and folded, ready to use.

NOW! Tack Cloth in Handy Rolls or Cut Bulk

Now you can get Tack Cloth packed the way it's easiest for you to use—either in 150 yard rolls of 36" wide cloth or in handy cartons—100 or more Tack Cloths to the carton.

No matter which way you buy it, you can be sure that every square inch will *stay* SOFT and TACKY until the very last bit is used up.

The Cut Bulk size is 18" x 36"—folded to 4½" x 18" for easy handling. *All of our Tack Cloth is Spontaneous Combustion-Proof, Lint-Free and Wax-Free.* It's clean and sanitary—*there's no waste.*

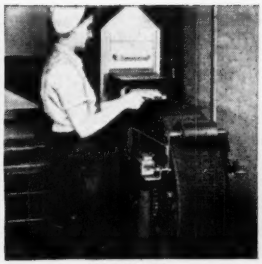
Write today for complete information, prices and samples.

BAUGHN CHEMICAL PRODUCTS CO.
The Tacky Wiper Specialists
7019 N. Ravenswood **Chicago 26, Ill.**

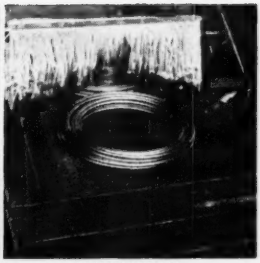
Envelopes — 144 to the Carton
Also Individually Packed in Glassine

— A WARRANTY OF SATISFACTION IN EVERY CARTON —

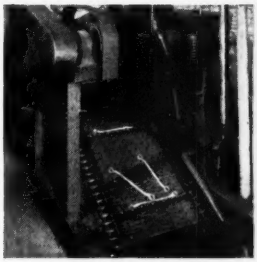
HOW CAN YOU USE *Cambridge* WIRE BELTS TO SPEED PRODUCTION ...REDUCE COSTS?



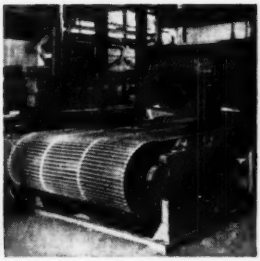
BRAZING



ANNEALING



QUENCHING



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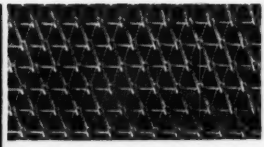


The Cambridge Rod-Reinforced Weave is widely used in the metal working industry. It combines high tensile strength with low thermal capacity and straight belt travel.

These are just a few illustrations of the many applications for Cambridge woven wire conveyor belts in your industry.

In any process that can be combined with movement, and under practically any operating conditions . . . heat, cold or corrosive agents . . . a Cambridge belt can reduce costs by eliminating manual handling, speed production by maintaining a constant flow of parts through processing.

Cambridge belts are available in any metal or alloy and with special attachments such as retaining selvages, cleats and drive mechanisms. They can be woven to close meshes that provide a smooth, non-marking carrying surface or to open meshes to allow free heat circulation or fluid drainage.

Whenever you have a problem concerning movement during processing rely on the experienced advice of your Cambridge field engineer. Write direct or call your nearest Cambridge office. See "Belting, Mechanical" in your classified telephone directory.

FREE CATALOG gives Cambridge belt design, specifications and construction features, also conveyor designs and metallurgical data. Write for your copy today.

The Cambridge Wire Cloth Co.

WIRE CLOTH | METAL CONVEYOR BELTS | SPECIAL METAL FABRICATIONS

Department A
Cambridge 12, Maryland

OFFICES IN PRINCIPAL INDUSTRIAL CITIES

Hall's new position places him second in command of Norgren engineering and in full charge of laboratory operations. Both men have previous experience in related work at the Norgren plant and their promotions were given as merit awards.

JULIUS H. NILL has been appointed Southern regional manager of the Metallizing Engineering Company, Inc., with offices at New Orleans, Louisiana.

Associated with the firm since 1945, Mr. Nill was formerly field engineer, handling sales in the middle and southern Atlantic states.

The Vonnegut Moulder Corp., Indianapolis, Ind., has appointed **OLIVER S. DeHAVEN** to re-assume the duties of chief engineer after an absence of four years. Mr. DeHaven served as chief engineer for the corporation from 1941 to 1948, and directed the research and experimental work on Vonnegut products.

The company also announces that **ERIC LINDENBORG** has joined its engineering division. Mr. Lindenborg will be in charge of demonstrations and experiments related to Vonnegut grinding and polishing equipment.

The Commonwealth Engineering Company has appointed **ALFRED LIPPMAN, JR.**, as general manager of its laboratories.

Alfred Lippman, Jr.

Mr. Lippman was with the Bay Chemical Company for nineteen years, the last twelve of which he was manager in charge of production, research, and development.

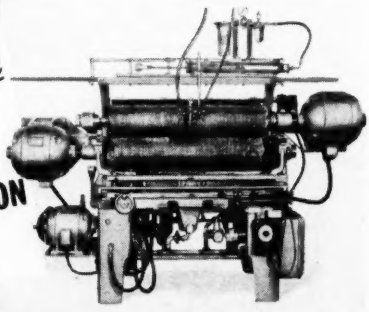
An honor graduate of the College of Engineering, Tulane University in 1929, he is a member of Tau Beta Pi, American Institute of Chemical Engineers, and American Chemical Society.

CLAIR

SURFACE FINISHING MACHINES

Working closely with your engineers we will develop a custom machine designed for maximum surface finishing efficiency on your particular application. Totally enclosed, abrasion-proof hydraulic circuits assure uninterrupted production and vastly reduced maintenance costs.

Engineered TO YOUR PRODUCTION NEEDS



For Surface Finishing: screw drivers, chisels, pliers, saws, wrenches, compacts, cigarette cases, fine silver, surgical instruments, fan blades, flat iron sole plates, many other similar items.

CLAIR MANUFACTURING CO., INC.

Specialized Machine Equipment For Glazing and Polishing Operations

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NOW - - - *Stripping of*

LACQUER, JAPAN, BAKED ENAMEL

is Fast, Safe, Economical, with

PELRON'S New Cold Strippers

UNISOL 45 Removes Baked Enamels

UNISOL 199 Removes Japan and Vinyls

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Use them cold—they're non-toxic, non-inflammable, non-injurious to clothing or any metal.

Write Today For Samples and Technical Bulletin 101

PELRON CORPORATION

7740 W. 47TH STREET, LYONS, ILLINOIS

Whatever You Make, PELRON Makes a Chemical to Help You Make It Better, Faster, Cheaper.

The appointment of **THURSTON V. V. ELY** as vice president in charge of sales of the Randolph Products Co., Carlstadt, N. J., manufacturer of industrial coatings, lacquers and synthetic products, was announced by W. G. Randolph, president.

Thurston V. V. Ely

Mr. Ely, a vice president of the organization since 1946, was previously in charge of sales in the New York City area. His promotion now puts him in charge of the entire sales program of the company which is presently supplying production finishes to customers throughout the world.

Mr. Ely has been with the firm since 1934. He is a graduate of Cornell University.

G. Daniel Davis, vice president in charge of industrial sales for the Nopco Chemical Co., Harrison, N. J., has announced the promotion of **LAWRENCE E. ROSSITER** as New England sales manager to replace **HAROLD J. WALDRON,** who has retired.

Laurence E. Rossiter

Also announced was the appointment of **THOMAS FAHEY** to the staff of the southern New England sales force and **JOHN R. CRAIG** to the Midwest staff.

A graduate of the New Bedford Textile Institute, Mr. Rossiter joined Nopco in 1940. In addition to the responsibilities of his new position, he will handle sales of the metallic soap products of the Metasap Chemical Company, a wholly-owned Nopco subsidiary serving the paint, varnish and lacquer fields.

Mr. Fahey, a graduate of Seton Hall University, has been associated with Nopco for the last five years. Mr. Craig joined the organization in 1941. Both men have gained wide experience in product control and application through their work in the Control Laboratory and Sales Product Laboratory.

LORENZO S. WASHBURN has become quality manager of Norton Company's Abrasive Division, succeeding **CHARLES J. HUDSON** who retired after 34 years with the company. The appointment was announced by Andrew B. Holmstrom, vice president and general manager, Abrasive Division.

Lorenzo S. Washburn

Mr. Hudson will be retained full time as consultant to assist the Abrasive Division on quality control problems. Known throughout the country for his work in quality control, he has written many articles and spoken widely on this subject.

Graduate of Tufts College, Mr. Washburn entered Norton Company in 1922 and worked in the research laboratory until 1931, at which time he was sent to the Company's English branch plant at Welwyn Garden City. Later he served as engineer to the works manager until appointed technical secretary to the general manager in 1943.

Mr. Washburn holds two co-patents with Wallace L. Howe, director of development, which cover the current T-type pulpstone stud design.

For a real good polishing job use

Keystone TURKISH Emery

FRESH SUPPLY AVAILABLE

KEYSTONE EMERY MILLS *Write for Sample* **4316 Paul St., Phila., Pa.**

The approach of another Yuletide Season (our 69th, incidentally) is a splendid opportunity for us to express appreciation to our friends in the metal finishing business—the people who have helped make Frederic B. Stevens, Inc., a success. We sincerely hope that this Christmas and the coming New Year will find you enjoying health, happiness and good fortune. We also hope that we may continue to serve as your source for "Everything For Metal Finishing."

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BRANCHES • SALES OFFICES
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INCORPORATED
FREDERIC B. STEVENS OF CANADA, LTD.
WINDSOR • TORONTO
ONTARIO

Carl Hansen is shown presenting to Wilbur O. Zinn an engraved plaque honoring Mr. Zinn as "Electroplating's Man of the Year" at the Chicago Electroplaters Institute dinner meeting.

MEETINGS

WILBUR O. ZINN, president of the National Plating Company of Chicago, was awarded the honor of "Electroplating's Man of the Year," bestowed on him by the Chicago Electroplaters Institute.

Mr. Zinn has been president of National Plating since 1945. He is a former president and now serves as a director of the National Association of Metal Finishers, and has been active in the NAMF since 1946.

A tireless worker in the CEPI since joining the organization, Mr. Zinn was instrumental in securing government and defense program recognition for more than 2,000 member companies in his group.

THOMAS F. BARRON, veteran MacDermid Incorporated salesman for the Providence territory, retired October 1, after almost 55 years of active service in the metal finishing business.

Thomas F. Barron

Joining the J. P. Bonett Company of North Attleboro, Massachusetts, at the age of 16 as a scratch brush operator, Mr. Barron, in 1917 started selling chemicals to the metal finishing industry, and after working for Hanson - Van Winkle, joined MacDermid in 1932.

During the Annual MacDermid Sales Meeting, he was honored at a banquet attended by the entire organization and was presented with a matched set of luggage.

GILBERT H. GIDLEY, who recently completed the Sales Training Course, at the Norton Co., Worcester, Mass., was appointed abrasive engineer in Chicago. Announcement was made by Ralph M. Johnson, vice president in charge of sales. **GORDON F. COLSON**, field engineer, who was temporarily covering this area, will resume his full time activities as field engineer in the Chicago area.

meetings OF INTEREST TO FINISHERS

Jan. 14-17. Plant Maintenance Show, Convention Hall, Philadelphia, Pennsylvania.

Feb. 16. Annual Educational Session and Banquet, New York Branch, A.E.S., Statler Hotel, New York, New York.

Mar. 10-14. Annual National Conference and Exhibition, National Association of Corrosion Engineers, Galveston, Texas.

Apr. 19. Annual Banquet and Educational Meeting, Boston Branch, A.E.S., Hotel Statler, Boston, Massachusetts.

June 16-20. 3rd Industrial Finishing Exposition and 39th Annual Convention, American Electroplaters' Society, International Amphitheatre, Chicago, Illinois.

Your Best Buy!

BUCKINGHAM *Greaseless* COMPOSITION

Fine Medium Coarse

Write Dept. C for Samples

REPRESENTATION FROM COAST TO COAST

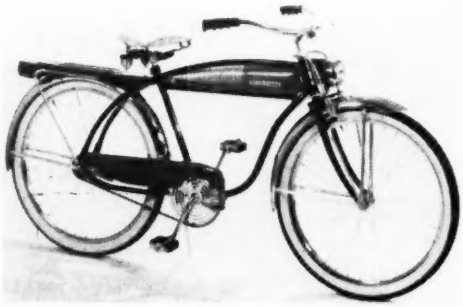
The **BUCKINGHAM PRODUCTS** *Co.*

14100 FULLERTON AVE. • DETROIT 27, MICH.

Finishes

Aluminum horses now travel the circular paths of the carousels. They are first sprayed with XIM Flash Bond followed by one coat of synthetic white metal primer. The horses are then glazed, receive one coat of white lead paint, and as many as ten flat japanned colors. A coat of clear varnish completes the finish.

(Photo courtesy Allan Herschell Co., Inc., North Tonawanda, N. Y.)



The Roadmaster, pride and joy of many youngsters, is finished by plating and painting. Frame, front fork, horn tank, chain guard and luggage receive a primer coat and high luster finish coat, both baked enamel. Embossed areas on horn tank and chain guard are chrome plated.

(Photo courtesy The Cleveland Welding Co., Cleveland 7, Ohio)

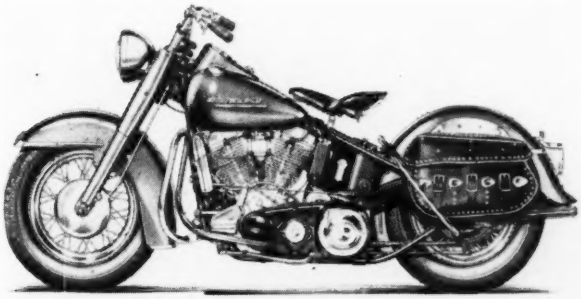
that aid in appearance and utility

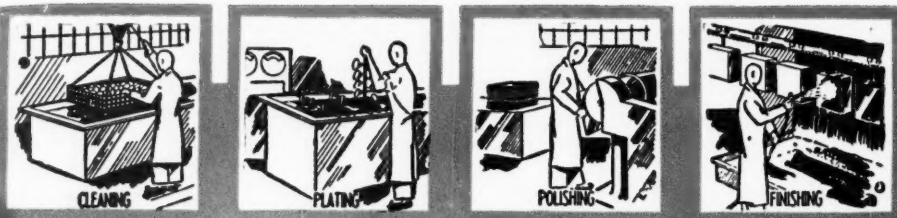
For the young contractor, the realistic Euclid Dump Truck is ideal. The Model Toy has steerable front wheels and three-point suspension. It is finished in orange with a baked enamel.

(Photo courtesy The Chas. Wm. Doepke Manufacturing Co., Rossmoyne, Ohio)

The Harley-Davidson "Big Twin" has chrome plated compression piston rings and silicone finished cylinders, exhaust pipe, and mufflers. Other parts are phosphatized and enameled in colors of blue, red, green, and black.

(Photo courtesy Harley-Davidson Motor Co., Milwaukee 1, Wis.)





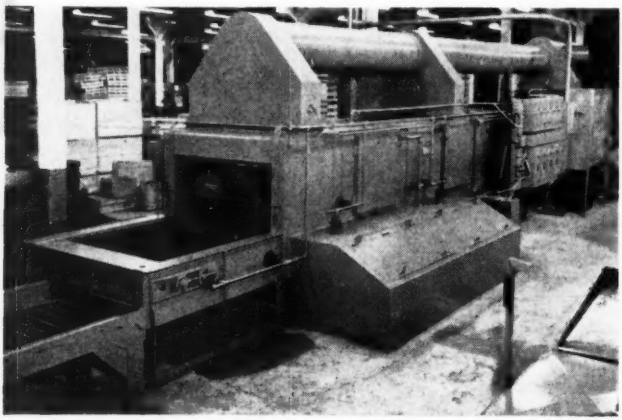
New • EQUIPMENT • MATERIALS • PROCESSES

Rust Proofing Machine Expedites Government Work

Currently in use at a prominent government installation, this advanced design rust proofing machine, Model CT-RP, features an unusually high capacity of 500 square feet of conveyor space per hour. Product of the Industrial Washing Machine Corporation of New Brunswick, New Jersey, the machine first sprays work with a rust preventive, the built-in, explosion-proof infra-red oven quickly dries it, and then the work is cooled to permit handling.

Safety features include an automatic carbon dioxide system and fully electrical operating controls. The continuous conveyor is kept free, clear, and clean of residue by a special rotating brush and a detergent spray. This self-cleaning feature eliminates the need to stop the machine and interrupt production to clean the conveyor.

The machine offers the extra advantage of rust proofing versatility because it is adaptable for various shaped and sized work.



Model CT-RP Rust Proofing Machine

All-Purpose Cleaner for Metal Parts

Following extensive field tests, the Magnus Chemical Co., Garwood, N. J., has announced a cleaner for all kinds of metal parts, Magnus 751. It is stated to be safe for all metals, not attacking, pitting, or marring aluminum alloys, bearing metals, cadmium, solder, die cast, or any other soft metal; it is nonflammable; it cleans at very high speed, penetrating, loosening and removing all foreign deposits faster and better than ordinary cleaners. A characteristic is the extremely long life of the cleaning solution. Magnus 751

Think of what

99% EFFICIENCY

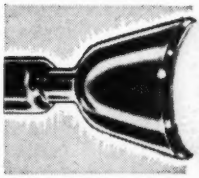
would mean in your own spray finishing department

Why, that's almost perfect, you'd say. Practically NO paint loss!

Hard to believe, isn't it? But it's a fact. The new RANSBURG No. 2 Electrostatic Process is making possible new efficiencies heretofore unheard of in the field of spray finishing. In many instances, efficiencies actually exceed 99%!

On most production lines, the RANSBURG No. 2 Process gives 25% to 75% more pieces per gallon than any other spray finishing system.

With the No. 2 Process there's NO overspray to be exhausted. NO compressed air used. NO operator skill required. And, practically all of the many uncontrolled factors in other systems have been eliminated.



Write for a copy of our brochure describing the No. 2 Process in more detail. Case histories of early installations are included in the brochure.

RANSBURG ELECTRO-COATING CORP.

Indianapolis 7, Indiana

RANSBURG

can be used in either hot or cold water rinse after the cleaning period.

According to the manufacturer, work can be placed in the cleaning solution and simply left there until it is needed. A pressure spray rinse with water or with safety solvent makes a part ready for use, thoroughly cleaned.

Where a large volume of parts must be cleaned regularly, the cleaner is said to work best when used in the Magnus Aja-Dip Cleaning Machine, where agitation speeds up the cleaning action and all traces of deposits are removed, making hand brushing unnecessary. This cleaner also strips paint and other coatings from the parts it cleans.

Magnus 751 follows Navy Aeronautical Specification C-86 and Army-Navy Aeronautical Specification AN-C-163.

Micro-Lap Equipment

The Murray-Way Corp., Birmingham, Mich., has developed an automatic, precision-polishing process known as Micro-Lap. The process and equipment were developed especially for the fast, accurate micro-surfacing of jet engine blades and buckets but has a wide range of other applications.

The Micro-Lap jet blade installations are eight-station, hydraulically-indexed units. Additional or fewer stations may be had as required. The heads are mounted on floor bases and operate continuously with no pause for indexing. The polishing jaws open automatically to receive and release the workpiece as it makes the cycle.

According to Murray-Way, the indexing table carries no weight except the blade-holding fixtures and the blades being processed. This feature greatly reduces maintenance and wear.

Successively finer grits under flood lubrication are used to accomplish a finish of 3 to 4 r.m.s. in a six-second cycle. Cycle time and individual station dwell times are fully adjustable to meet job requirements. Head stroke may also be changed for longer or shorter blade lengths.

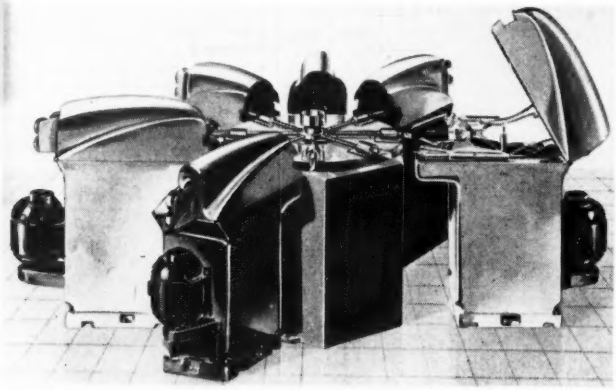
Selenium Rectifiers

Selenium rectifiers for plating and anodizing have been added to the line of metal finishing processes, materials, and equipment sold by United Chromium, Incorporated, 100 E. 42nd St., New York 17, New York.

The Unichrome Selenium Rectifiers are available in units ranging up to 10,000 amperes current capacity, starting at 250 amperes up through any multiple thereof. The voltage ratings likewise cover a wide range, from 6 to 50 volts. All the rectifiers can be supplied as self-contained units with built-in or remote controls to give zero to full rated output voltage and as basic units with no output voltage control.

Self-contained selenium rectifiers can be equipped with 36-position tap switch controls or 22-position non-interrupted voltage controls. Where infinite changes of voltage or current are required the Unichrome Rectifier can be equipped with a saturable core reactor that provides the ultimate in non-interrupted voltage or current control. Automatic controls for voltage and current can also be supplied.

Unichrome Selenium Rectifiers are being made to United Chromium specifications by Richardson-Allen Corporation. They are manufactured with only the highest grade selenium plates, triple-coated to provide protection against corrosion. All wiring is of the non-flammable type. Transformers are



Micro-Lap Equipment

you save 50% in TANK HEATING and COOLING with PLATECOIL

(REPLACE PIPE COILS)

★ You SAVE 50% in tank SPACE
★ You SAVE up to 50% in initial COST
★ You have 50% LESS WEIGHT to handle
★ You SAVE 50% in maintenance LABOR as plates are changed from outside the tank without dumping solution

. . . besides all these you get faster heating or cooling. Take advantage of the engineering assistance offered by Kold-Hold to help you with your heat transfer problems.

Send for complete technical manual and descriptive Bulletin No. P50.

PLATECOIL
Division
KOLD-HOLD MFG. CO.
LANSING 4, MICHIGAN

Why Platecoils Cost Less

LOW FIRST COST

The initial cost of Platecoil is often 50% or more below the cost of equivalent pipe coil depending, of course, on the materials used in construction.

EASY INSTALLATION

By the use of "quick change hangers" Platecoil installations can be made in open tanks in one-half hour or less by one man and a helper.

NO THREADED JOINTS IN TANK

The entire Platecoil is electric welded and pressure tested. There are no joints to corrode or leak. Both connections to the Platecoil can be located above the liquid level where there is no danger of thread corroding and freezing.

GREATER TANK CAPACITY

A 22" x 47" Platecoil gives the same heat transfer surface as 32 feet of 1½" pipe. This pipe requires a space approximately 30" x 60". Platecoil thus saves about 50% over equivalent pipe coil.

WEIGHS 50% LESS

Weighing only about half as much as equivalent pipe coil, Platecoil is easy to handle. A whole maintenance crew is not needed to transport and install Pipecoil.

TANK MAINTENANCE WITHOUT LOSS OF SOLUTION

There is no need for workmen to get inside the tank in order to make replacements or repairs. A Platecoil can be removed in a matter of minutes with the solution still in the tank.

LITERATURE

The new Platecoil Bulletin furnishes a complete description of the Platecoil method of tank heating. Write for your copy today.

HIGH BTU TRANSFER

More prime surface of Platecoil can be installed in a given area than can be obtained with pipe coil. Thus a more compact Platecoil unit provides much greater BTU transfer per unit area than can be obtained with pipe coil. Quick starts in heating tank solutions mean more hours of productive time.

Kold-Hold Manufacturing Company, Lansing 4, Michigan

made for heavy duty use with glass and mica insulation. Before shipment, each rectifier is tested at rated load as a completely assembled unit.

DeVilbiss 3 and 5 H.P. Air Compressor

The smoothly and quietly operating features of a DeVilbiss V-type, four-cylinder, two-stage air compressor have been made available to the users of 3 and 5 h.p. air compressing outfits by The DeVilbiss Co., Toledo 1, Ohio. The 3 and 5 h.p. sizes of these modernly designed air compressors have been released by the company and now augment its line of 7½, 10 and 15 h.p. units. All of the sizes are available for either 125 or 175-pound pressure service.

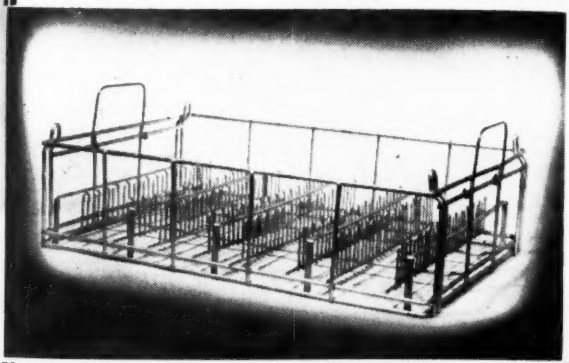
DeVilbiss Air Compressor

The V-type compressor is built for long life and rugged, heavy-duty service. The purpose of the four cylinders, DeVilbiss engineers state, is to divide the work and reduce the amount of heat generated. Heat that is generated is rapidly dissipated by finned cylinder heads, blocks, inter-coolers and check valve, aided by a highly effective fan-type flywheel.

All operating parts have been carefully counterbalanced and designed to prevent vibration and assure a smooth and quiet running compressor.

All outfits are equipped with automatic

WIRE BASKETS
MADE TO YOUR SPECIFICATIONS



WIRE MESH

EXPANDED METAL

PLAIN STEEL

HOT TIN DIPPED

NESTING OR STACKING FEATURES

We will design baskets to solve all your Material Handling problems.

SPECIAL CARRIER BASKETS TO PROTECT MACHINED SURFACES

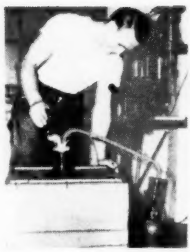
L. G. EVANS & CO.
737 S. WESTERN AVE.
CHICAGO 12, ILL.

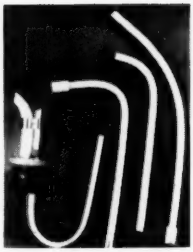
Season's
Greetings
J. J. Siefen CO.
DETROIT 9, MICH.

pressure switches to start the motor when the desired maximum pressure has been reached. ASME air receivers and high starting torque electric motors are standard equipment on all sizes.

Plastic Acid Pump and Tubing

Pouring acids from carboys or barrels is safer, cleaner, and easier with pouring spouts and acid pumps made of Bakelite polyethylene tubing marketed by the Hanson-Van Winkle-Munning Company, Matawan, N. J. Steady, even flow without spurts or splashes is made possible by a safety air vent and spout. Pneumatic acid pumps that operate at floor level, also made of this acid-resistant tubing, eliminate awkward lifting or tilting of heavy drums, carboys, or stainless steel containers. Pressing a bulb on top forces air into the container and in turn sends a smooth stream of liquid out of the spout at approximately two gallons per minute. Pressing up on the air relief valve stops the flow instantly. Extensions to the spout can be made with flexible polyethylene tubing which has threaded ends and joints. Easily transferable from one container to another, these compact



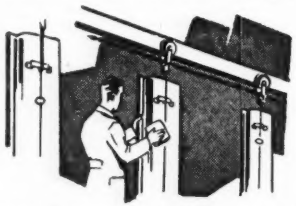


Plastic acid pump (left), and pouring spouts and tubes.

acid pumps make it impossible to generate dangerous air pressure inside glass containers, it is stated. Recommended for use with the acid pumps, the tubing satisfactorily handles such volatile liquids as carbon tetrachloride, phenol (five per cent saturated), oil of vitriol, xylene, glycerine, peroxide and hydrofluoric, nitric, muriatic, citric, phosphoric, sulfuric, and acetic acids.

DUST-ALL Tack Rag

for better, cleaner finished jobs



Remove the specks, lint, dust from surfaces to be painted; wipe them off with a Dust-All Tack Rag; be sure of fine, blemish-free, finished jobs.

Get the Dust-All Tack Rag in the familiar Red Checkered Bag; also available in 150-250-500 yard rolls.

HARDING Manufacturing Co.

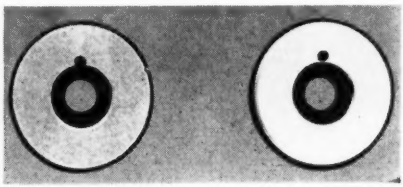
10634 GRATIOT AVE.
DETROIT 13, MICH.

Blue Magic Steel Finishing Compound No. C-5

Blue Magic Steel Finishing Compound No. C-5, a special purpose chemical compound for barrel finishing alloy steel parts in minimum time, is offered by the Blue Magic Chemical Specialties Co., 2135 Margaret St., Philadelphia 24, Pennsylvania.

The manufacturer states that with C-5 Compound, and any generally used tumbling medium, bright mirror finishes can be put on steel parts in time cycles of 20 to 40 minutes. Also, the compound can be used in certain applications for both roughing and finishing to produce low

Steel washer before and after burnishing for two hours with 5 ounces of Blue Magic Compound C-5 and 100 pounds of Alundum Tumbling Abrasive No. 6-T.



NOPCO* 1067-A

...SAVES PICKLING ACID

...AIDS ANODIZING

...IMPROVES PHOSPHATIZING

In all of these important operations—pickling, anodizing, phosphatizing—the remarkable ability of Nopco 1067-A to reduce surface tension in mineral acid solutions leads to definite economies, improvements in processing, and better final products.

PICKLING—Addition of Nopco 1067-A to the pickling bath—

(a) reduces loss of acid solution through carry-over to the rinsing tank by 30% to 40%;

(b) reduces acid contamination in operations following pickling—helping to increase die life;

(c) effects faster and more uniform penetration of oxide scale—assuring clean, *smooth* metal surfaces after pickling.

In general, 0.1% of Nopco 1067-A on the weight of the acid solution gives outstanding results.

ANODIZING—Use of Nopco 1067-A in the anodizing bath not only affords high drain-off of the acid solution, but results in "taming" of the bubbles caused by air-blast agitation. Bubbles are reduced in size and they burst gently, minimizing spray. In some instances, need for costly lead-lined exhaust fans has been eliminated.

PHOSPHATIZING—Addition of 0.1% of Nopco 1067-A to "Bonderizing" chemicals lowers surface tension substantially. This results in exceptionally even spreading which promotes excellent over-all adherence of paint or enamel to ferrous metal.

Mail the attached coupon today. We'll send you promptly full information about Nopco 1067-A —the unique wetting agent which not only assures improved products but saves money, time, and labor in all types of acid treatments.

*Reg. U. S. Pat. Off.

NOPCO TRADEMARK EVOLVED THRU RESEARCH

NOPCO CHEMICAL COMPANY
Harrison, N. J.

BRANCHES: Boston • Chicago
Cedartown, Ga. • Richmond, Calif.

Nopco Chemical Company
Harrison, New Jersey

Gentlemen:
Please send me full information about Nopco 1067-A

Name .....
Firm .....
Address .....
City ..... Zone ..... State .....

micro-inch surface readings, true color, and uniform results.

Blue Magic Compound No. C-5 is a non-dusting, soapy, concentrated powder that has no obnoxious odor and is not irritating to the skin. It is said that detergency and rinsibility are outstanding characteristics and that parts leave the tumbling barrel free from chips, abrasives, oil traces, or any other foreign matter that might impair subsequent plating, painting, or other operations.

"Staize-Clene"

A discovery in paint formulation which prevents dirt and grime from penetrating into the pores of paint film has been announced by the Enterprise Paint Manufacturing Co., Dept. G.P.H., 2841 S. Ashland Ave., Chicago 7, Ill. Called "Staize-Clene," the paint will stay clean 79 to 90 per cent longer, and research indicates that it can be washed 18 per cent faster.

Made with Syncon, Staize-Clene covers most surfaces with one coat because of its unusual hiding power. Applicable by brush, spray, or roller coat, it can be tinted with colors in oil and can be repainted without any special preparation of the surface, it is stated.

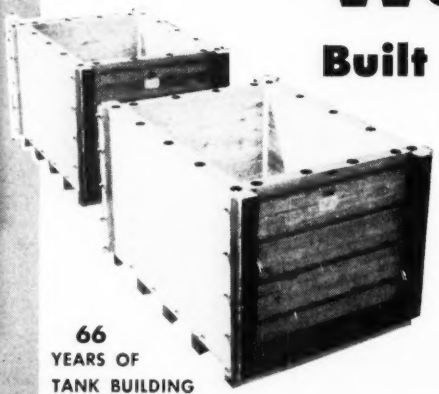
Gel-Time Meter

A gel-time meter, designed to measure the time required for fluid thermosetting compositions to reach a point of rapid viscosity change during polymerization, has been announced by General Electric's Special Products Division, Schenectady 5, N. Y. According to the company it will be an aid in the evaluation of thermosetting compositions used in the manufacture of monomers, resins, varnishes, and other protective coatings. It can also be used in studying the effects of such variables as reaction temperatures, catalysts, inhibitors, and quality of the main reactants.

The device measures the gel time, a direct function of viscosity drag in the test sample , by means of a rotating spindle suspended from a torsional spring. As viscosity of the fluid being tested increases, it creates an additional drag on the spindle which is immersed in the fluid. At the gel point, viscosity increases very suddenly and the increased drag on

WOOD TANKS

Built to Specifications



66 YEARS OF TANK BUILDING SERVICE

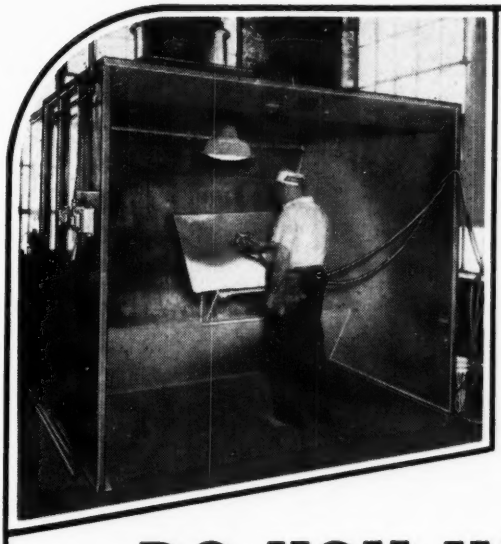
Plating and pickling tanks built to your specifications is a Kalamazoo specialty — any size or shape — fir, oak, cypress or redwood.

Tanks on left were made for large manufacturer of automobiles. They are 88" x 64" x 62" — made of 8" long-leaf yellow pine with B & M anti-acid metal tie rods.

Write today for estimates and suggestions.

Kalamazoo TANK AND SILO COMPANY

1228 HARRISON ST. • KALAMAZOO, MICH.



That

FINISHING TOUCH

ALWAYS COUNTS

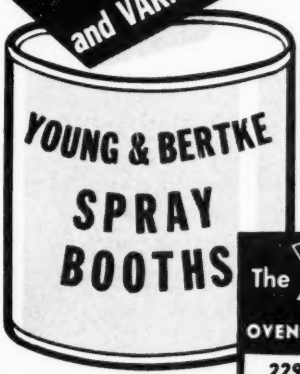
Strobridge Lithographing Company adds "the finishing touch" to color charts for Paint and Varnish Industry. Wood panel effects, enamel and paint colors take on more zip and sparkle.

DO YOU HAVE A FINISHING PROBLEM?

COLOR CARDS PROCESSED

FOR THE PAINT and VARNISH INDUSTRY

YOU'RE THE WINNER WHEN YOU BUY . . YOUNG & BERTKE . . SPRAY BOOTHS



Located in a thickly populated section, it was necessary at Strobridge, to dilute escaping paint spray and fumes. Workers' comfort and health could not be impaired. Fire hazards had to be eliminated.

Now production could be increased to hundreds of large sheets per day, and two men could handle the job.

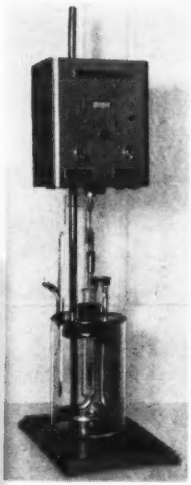
Your customers will appreciate the extra beauty . . . "THAT FINISHING TOUCH" . . . because the vast facilities of a Young & Bertke (water type) Spray Booth control color requirements . . . subdue fumes and escaping spray.

You will thank yourself for the extra profit from the operation and the on-the-job-performance of Young & Bertke Spray Booths.

The YOUNG & BERTKE Co.

OVENS • SPRAY BOOTHS • DUST and FUME CONTROL

2291 BUCK ST. CINCINNATI (14), OHIO



G. E. Gel-Time Meter

the spindle closes a switch which stops the timing mechanism and actuates the electrical indicator.

Another important feature of the device, according to G. E., is the control unit which contains an alarm system designed to give both audible and visible indications when the fluid reaches its point of incipient gelation. The meter automatically stops at this point, leaving the final reading — to the nearest tenth of a minute—on the meter's dial. The control unit also contains the timing circuit and power and test switches.

A small Calrod heating unit and a condensing coil are used to keep the boiling bath at a known constant temperature. Mounted on a ring stand with a 7 x 10-inch base, the gel-time meter has an overall height of approximately 20 inches and weighs 20 pounds. It operates on 115-volt, 60-cycle, 350-watt power.

FORM-A-ROC

FIRST-COAT

FOUNDATION

FOR FINE FINISH

1. Dries with lacquer speed.
2. Has double lacquer solids at spray gun.
3. Fills very well—sands easily.
4. Adheres tenaciously to steel, wood, presdwood, aluminum, galvanized metal, etc.
5. Holds out lacquer, synthetic or oleoresinous enamels exceptionally well.
6. Thins 3:1 with xylol.
7. Available in GREY, SALMON and OFF-WHITE.
8. Ground well to smooth texture.

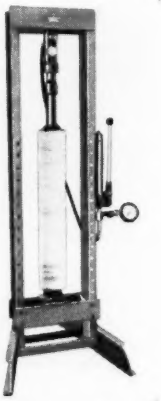
MADE BY

The Varnish Products Company

5208 Harvard Avenue Cleveland, Ohio

Hydraulic Arbor Press

A hand-operated 20-ton hydraulic arbor press has been introduced by the Clair Manufacturing Co., 1010 S. Union St., Olean, N. Y. Primarily developed for mounting buffs on polishing spindles for Clair Surface Finishing Machines, the press also is recommended for many additional operations, such as broaching, assembling, straightening, bending, offsetting, squeezing, pressing, flattening, and blanking.



Clair 20-Ton Hydraulic Arbor Press

In the buff mounting operation illustrated a hollow ram extension slips over the polishing spindle to exert pressure downwards on the polishing buffs. For other types of operations the table is easily adjusted to any desired height. Offering a ram travel of 5 inches, the design permits the pump and ram to be removed from the steel framework and used throughout the plant as a handy portable unit. Dimensions inside the framework are 17¼ by 60 inches.

Buffing Compositions for Chromium Plate and Stainless Steel

The Hanson-Van Winkle-Munning Co., Matawan, N. J., presents a rounded-out line of buffing and polishing compositions for the plating and polishing industry. Of special note are the compositions for chromium plate and stainless steel, as follows:

These famous

CHROMALOX ELECTRIC HEATERS

solve hundreds of heating problems

efficient, dependable electric heat

Easy to Install CHROMALOX Electric Heaters give clean, dependable, accurately controlled heat where and when heat is needed. They produce uniform and accurate temperatures by automatic or manual control. Low initial costs, low installation costs and low operating costs are among the advantages of using CHROMALOX Electric Heaters in tanks, ovens, air ducts, kettles and other applications requiring economical and efficient heat.

Discuss your baking, degreasing, curing, and other heating requirements with a CHROMALOX Application Engineer. Let him show you how CHROMALOX Electric Units can help do your heating jobs more efficiently at less cost.

for drying, degreasing, baking, etc.

CHROMALOX

ELECTRIC HEAT FOR MODERN INDUSTRY

EDWIN L. WIEGAND COMPANY

7552 Thomas Boulevard, Pittsburgh 8, Pa.

WANT MORE FACTS?

Request the useful booklet "100 Ways To Apply Electric Heat." It contains photographs and drawings showing Chromalox Electric Heaters at work in plants throughout the United States. Write today for your copy.

IC 54

6-B-72: extremely high coloring; made from aluminum oxide flour; will not scratch; suitable for use on highest grade chromium finishes ranging up to jewelry. 6-B-86: a white production rouge with a hard binder for carbon or stainless steel or chromium plate; excellent for plumbers' goods and automobile accessories; produces high color. 6-B-66: made from specially selected aluminum oxide flour; well balanced for general use, where fast cutting and good coloring are desired. 6-B-97: exceptionally fast cutting for carbon or stainless steel, molded in rectangular shaped bar for hand or automatic application; fair color.

Spray Gun with Built-In Compressor

A portable sprayer has been introduced by Kapner Hardware, Inc., 2248 Second Ave., New York 29, N. Y., which weighs only 17 pounds and has its own built-in compressor. Trade named the "Payswell Spray-pak," it comprises a complete spray gun system including dual piston type built-in compressor, self-lubricating 10,000 r.p.m. motor, precision-built mixing head and gun, all built into one unit. Any liquid that is sprayable can be used and the spray rate is stated to be 1 quart in 4 minutes at 50 pounds air pressure.

"Payswell Spray-pak"

The unit is supplied with a carrying case and spare aluminum cannisters, covers, gaskets, three interchangeable nozzles, strainers, respirator with refills, brush, oil, and instruction manual.

Powerful, direct-connected (no gears), 3450 r.p.m., 100-120 v AC air-cooled motor. All sealed ball-bearing construction. Die-cast aluminum housing, polished. All-position handles. In hand weight only 5 lbs. Insulated with ground wire for wet as well as dry sanding or rubbing. Available accessories—deep contour pads, surface plates, felts, etc. Takes any sheet abrasives—3 covers 4½" x 6½" from standard 9" x 11" sheet.

A time saving quality tool priced so every worker can have one.

Write for Circular

SpeedWay MANUFACTURING CO.
1895 So. 52nd Ave., Cicero 50, Ill.

"VPI" Rustproofing Crystals

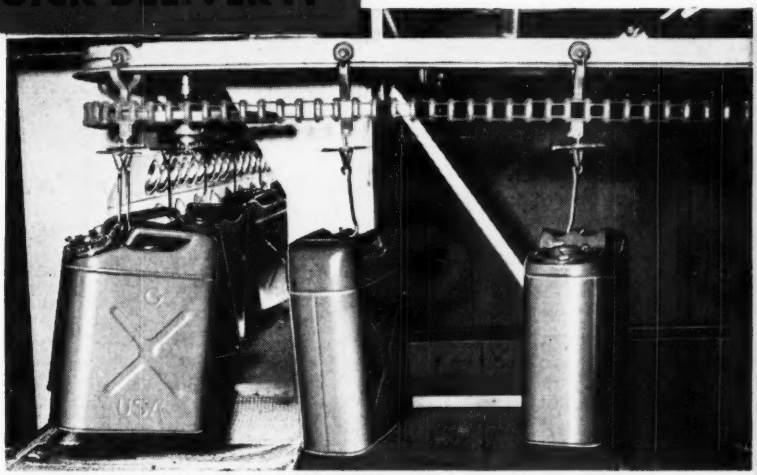
A method of preventing rust and corrosion of metal parts, in the presence of air and moisture, is provided by "VPI" crystals, a slightly volatile amine nitrite available from the Shell Oil Co., 50 W. 50th St., New York 20, N. Y. This volatile corrosion inhibitor is now being used in protecting metal parts, assemblies, instruments, and finished products during shipment, storage, and through various processing steps.

Being slightly volatile at atmospheric temperatures, VPI emits vapors which are carried by convection and diffusion to all surfaces of the metal, where they condense to provide a thin protective layer. A powder-like substance, it can be applied by placing it in a package enclosing the part to be protected; by blowing it into an area to be protected; by putting it into a water or alcohol solution and covering the metal parts in tote boxes. An unusual characteristic of

Lowest Cost Infrared

QUICK DELIVERY!

- **Meets Government Requirements for Baking Finishes on Military Products**



This Jensen finishing system turns out 450 Blitz Cans per hour at Metal Carrier Corp. in Grand Rapids, Mich., according to R. W. Stevenson, Consulting Engineer. From raw material to finished product fabrication, testing, finishing, and packaging requires only 48 minutes. Jensen material handling, water dry-off and paint baking ovens perform the major space and time consuming operations efficiently and at lowest cost.

Recommendations furnished to job specifications.

Jensen **SPECIALTIES INCORPORATED**

● Representatives In Principal Cities

9331 FREELAND AVENUE • DETROIT 28, MICHIGAN

MANUFACTURERS OF *ECONOMY-ENGINEERED* RADIANT HEAT EQUIPMENT

"DUAL HEAT" INFRARED OVENS • CONVEYORS • PAINT DIP TANKS

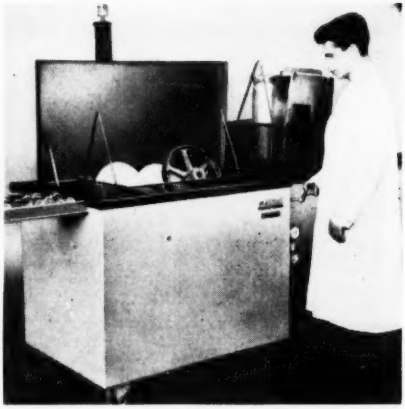
VPI is that it will arrest corrosion at any advanced stage, it is said.

Metal parts protected by VPI are ready for instant use, it is stated, since there is no grease or oil to remove. Relatively small quantities of VPI, established by practice, are required to give adequate protection. It is claimed that one gram of VPI will protect a cubic foot of metal parts, or surface, for periods up to a year. Solutions of from 2 to 4 per cent are effective in protecting processed metal.

Parts Cleaning Machine

The Equipment Div., Magnus Chemical Co., Inc., Garwood, N. J., has announced the 1952 Magnus Aja-Lif Parts Cleaning Machine for solvent and alkali cleaning. Batches of parts can be cleaned in this unit, which can be used also for quenching, wax coating, and protective coating of metal parts.

The Magnus Aja-Lif is air powered, not air agitated, and is operated by a single lever. A flick of the lever brings the platform to the top of the tank, out of the liquid for inspection, loading and unloading the work. A second flick of the lever lowers the platform to the bottom of the tank where the work is automatically and vigorously agitated up and down in the solution, "shearing" the dirt from the parts in a very short time, thus eliminating hand scrubbing or brushing.



1952 Magnus Aja-Lif Parts Cleaning Machine

The Aja-Lif Cleaning Machine is available in three sizes, and is heated by gas, steam, or electricity.

BUILD A BETTER FINISHING DEPT.
Improved
DETROIT
HANDY "TAC" RAG
NON INFLAMMABLE
Switch to DETROIT "TAC" RAGS
and avoid rejects. Remove all dust, lint and sand quickly, efficiently. The standard for 17 years. Order from your supplier today, or send for sample.
FLAME RESISTANT
DETROIT
HANDY "TAC" RAG
DETRO MFG. & SALES CO., INC., CULVER CITY, CALIF.

Aerobrite Addition Agent

The Industrial Chemicals Div., American Cyanamid Co., Rockefeller Plaza, New York 20, N. Y., has available a process aid, Aerobrite Addition Agent, for use in cold drawing, porcelain enameling, and tin plating.

The addition of recommended quantities of Aerobrite to acid pickling baths used in preparatory treatment of steel to be cold drawn, and in similar pre-treatment of steel sheets to be porcelain enameled is claimed to provide many advantages.

An example is in the preparation of steel sheets to be porcelain enameled, where Aerobrite can be used as a relatively non-toxic replacement for sodium cyanide in the removal of iron salts. Its advantages are summarized by the company: (1) handling and storage of highly toxic sodium cyanide are eliminated; (2) the problem of disposal of waste sodium cyanide liquors is eliminated; and (3) Aerobrite is readily available in minmum 100-pound bags.

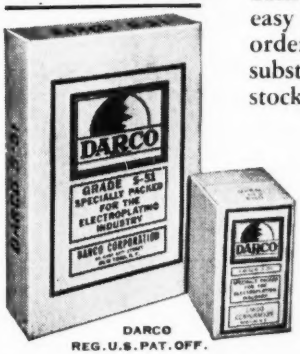
Start Clean... *Stay* Clean!

Smart boy! He makes sure no careless pigeon wastes the time, effort, and cash he spends on slicking up! With Red Label Darco S-51 to depend on, no smart plater will risk all the labor and expense of cleaning work for plating by putting the metal into a bath of questionable purity.

Start clean . . . *stay* clean! Red Label Darco S-51 adsorbs in its pores the impurities that cause trouble in plating baths . . . takes them out of the bath before they can be deposited on the freshly cleaned surface of your work.

Red Label Darco helps you save on scarce anode metals . . . helps you do a better job with thinner deposits . . minimizes rejects.

With clean metal . . . keep the bath clean



Red Label Darco S-51 is especially treated for use in plating—the only activated carbon that meets the benzol-mercury test! It is especially easy to handle . . . easy to wet . . . easy to make into a slurry. Place your order for Red Label Darco today. And don't accept substitutes! —practically all suppliers carry Darco in stock.

DARCO DEPARTMENT

ATLAS POWDER COMPANY

Darco General Sales Offices

60 East 42nd Street, New York 17, N. Y.

PRODUCT LITERATURE

For further information on any product mentioned in this issue—use the READER SERVICE CARDS between the covers.

Brady Quik-Masks, handy self-adhesive, pre-cut masks and gaskets which can be applied quickly without moistening to the areas requiring protection are the subject of **Bulletin No. 160.** Included in its pages are illustrations of applications, size lists for rectangular, square and circle masks, and prices. Illustrated throughout, the four-page bulletin and samples may be obtained from the W. H. Brady Co., Dept. 308, 1602 E. Spring St., Chippewa Falls, Wisconsin.

Selenium Rectifiers. A bulletin on selenium rectifiers and auxiliary controls has been released by the Rapid Electric Co., 2881 Middletown Rd., New York 61, New York. Bench rectifiers, self-contained rectifiers, remote and automatic controls and periodic reversing equipment are some of the units listed in 12-page **Bulletin RP-51.** General design features, pictures and size-diagrams, circuit diagrams and tables listing dimensions and output capacities of the various models are included.

Among the auxiliary controls and accessories discussed are such units as remote control units, synchronous timers, automatic programming, voltage and current stabilizers, and automatic voltage regulators.

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BLACKENING SALT

Black Oxide finishing for rust resistance and decorative parts. Speedy black coating in water solution with no electric current. Permanent black finish on ordnance parts, tools, aircraft, bearing races. Dazzling black decorative finish for television cameras, business machines, hardware, metal screens and machine parts. Excellent bond for paints and enamels. Simple one bath operation. Write for bulletin H-16. Park Chemical Co., 8074 Military Ave., Detroit 4, Mich.

Enthone Cleaners. Catalogs and data sheets on metal cleaners are available from Enthone, Inc., 442 Elm St., New Haven, Conn. Emulsion Cleaner 75, a solvent cleaner, is usable for removing heavy oil films and solid dirt. The catalog lists the advantages and uses of this cleaner, instructions and operating procedure.

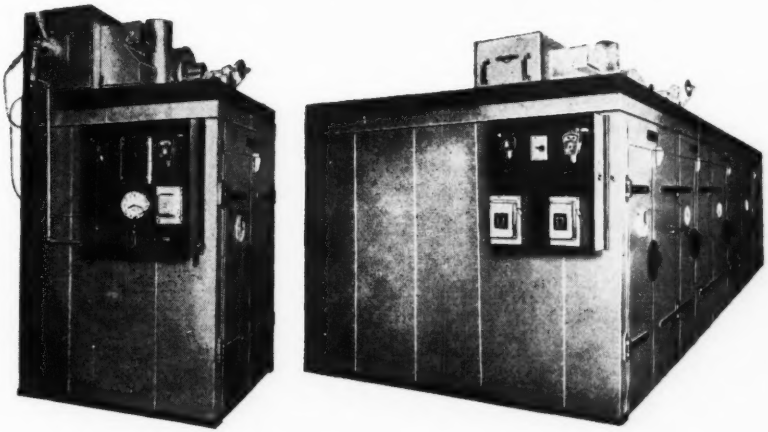
Data sheets discuss Aluminum Cleaner NE, a non-etching type cleaner, Cleaner 100, a soak and electrolytic cleaner for steel, and Zinc Cleaner 20, an anodic cleaner for zinc base die castings. Characteristics, directions, and operating instructions are given in these data sheets

Buffing and Polishing Compositions Hanson-Van Winkle-Munning Co., Matawan, N. J., has available a large illustrated bulletin, **C-100,** which covers bobbing composition, crocus compositions, chromium coloring compositions, emery paste and cake, greaseless compositions, hard rubber and plastics compositions, lime compositions, lime (powdered and lump), liquid compositions (Acme), liquid composition equipment, polishing tallow, principal classifications of buffing compositions, pumice (powdered and lump). The bulletin also covers rouge (bar and powdered), stainless steel and carbon compositions, Tripoli (powdered), water dispersible compositions, and white coloring compositions and has a recommendation chart and index.

Koroseal Lined Tanks. Nukem Products Corp., 110-120 Colgate Ave., Buffalo 20, N. Y., has issued a catalog on Koroseal sheet linings which are applicable to

KOCH OVENS

• COMPACT DESIGN • SUPER-EFFICIENT
• SHOP-TESTED AND READY FOR USE



They're production-line assembled . . . built from standard parts, thus give you all the cost advantages of mass production. Shipped to you complete, pre-tested and ready to do your job at minimum cost. Backed by 78 years of metal-working experience. Get the complete story now!

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EVANSVILLE, INDIANA

For more complete information on products and processes use READER SERVICE CARDS inside covers.

pickling and acid tanks, ventilation and exhaust systems, barrels and drums, pipes and pipe fittings, plating racks, rinse baskets and utensils.

Corrosion resistance of Koroseal is tabulated with respect to plating solutions, organic materials, and solutions of inorganic acids, salts, and alkalies. Properties, special features, effects of temperature, and limitations of the lining are discussed.

The company also has available a bulletin on Saran Rubber for lining storage tanks, tank trailers, tank cars and barges, processing and production tanks, and pipes, fittings, and valves.

"Liquid Envelope" Strip Coating. Better Finishes and Coatings, Inc. has issued the first four in a series of illustrated bulletins on interesting uses of "Liquid Envelope" by well-known concerns. Additional examples of unusual ways to use various formulations of the film will be covered in forthcoming data sheets. The current series, titled "On the job with—'Liquid Envelope'," show how strip coating is being used as a protective coating during the assembly of cream separators; as a stop-off in nickel plating clad sheet; and for packaging aircraft spare parts.

A request on your letterhead to Better Finishes & Coatings, Inc., 272 Doremus Avenue, Newark 5, N. J., will ensure receipt of present and future issues of these bulletins.

To simplify for industrial plant men the selection of products complying with government specifications, E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa., has issued an eight-page booklet entitled, **"Houghton's Government Specification Products."** This handy reference contains the listing of all Houghton products meeting governmental specifications in the following classes: rust preventives, lubricants, metal working aids, cutting oils, and leather and synthetic rubber products. The listing includes the specification number and the name and description of the approved Houghton product.

A 28-page illustrated booklet, **"Four Good Steps Toward Better Electroplating on Steel,"** giving specific recommendations for effecting improvements in the average cycle for cleaning steel before electroplating, can be obtained from Oakite Products, Inc., 120 Thames St., New York 6, New York.

The booklet lists in detail the benefits to be gained by: (1) precleaning more thoroughly; (2) rinsing more thoroughly; (3) using reverse current cleaning for all electrocleaning of steel; and (4) using an efficient electrocleaner that provides high conductivity, superior smut removal, long solution life and other advantages.

Also of interest to platers are the answers presented in the booklet to such questions as: How can cleaning costs be reduced while plating quality is being improved? What are four easy ways to improve the average rinse tank? What rinsing fault invites trouble in the plating of high-carbon steel? How can an ordinary electrocleaning cycle be transformed into an exceptionally good cycle?

"Sprayways," a graphic 16-page rotogravure brochure introduced by The DeVilbiss Co., Spray Painting Equipment Div., Toledo 1, Ohio, is a ready reference to many DeVilbiss spray equipment uses and is designed to fit standard file folders.

Nearly 100 photographs have been incorporated in the publication to graphically display the many spray equipment uses. The photographs are actual scenes

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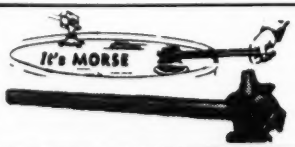
DRUM PLUG WRENCH
Instantly loosens, tightens 95% all plugs or bungs in steel drums. Has 16" extra-strong steel tubing handle. Wgt. only 2 lbs. Order 1 or more today!



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TILTING TUMBLING BARRELS

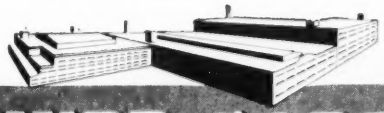
Available in Kiln-Dried Maple or Steel Shells

Process thousands of pieces at one time—faster, better and at lower cost—with Globe Precision Tumbling Barrels, dependable for 47 years. Globe's exclusive six-way work shifting motion cuts tumbling time and increases action. Speeds as low as 30 revolutions per minute assure finer finishes of non-ferrous metal parts. Motor is compactly mounted above the gear segment for space economy.

Free Experimental Service

Hupp's Experimental Engineering Laboratory can show you how to cut finishing costs. Just send samples of the parts to be processed along with a finished part. Write today! There's no charge or obligation.

Hupp Manufactures a Complete Line of Tumbling Barrels and De-Burring Machines.



HUPP CORPORATION

GLOBE STAMPING DIVISION

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taken in industrial plants, in shipyards, and in many other places where spray painting equipment is being used. One section has scenes taken inside the DeVilbiss plant, showing rigid quality control and manufacturing procedures.

Finger Buffs. Geo. R. Churchill Co., Inc., 75 Fayette St., North Quincy 71, Mass., has available a four-page catalog describing and showing the company's various types of buffs. The five design features by which buffs can be modified, type of cloth, type of finger, amount of cloth per finger, amount of sewing per finger, and diameter of center are pointed out.

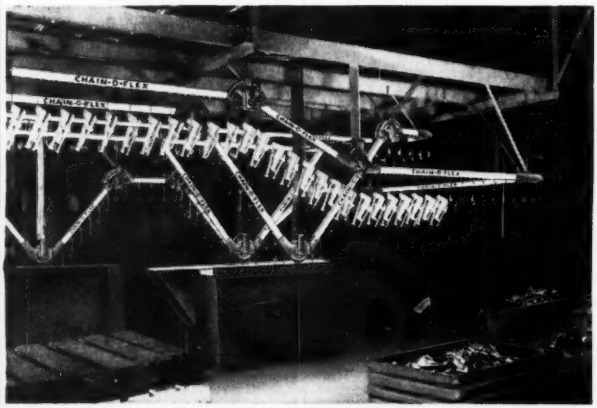
U. S. Government Specification Finishes. The Egyptian Lacquer Manufacturing Company, in an effort to be of service to product manufacturers and commercial finishers, has published a booklet listing practically all United States Government Specification Finishes issued to date of this printing. The booklet lists the United States Government Specification Code Number, gives complete ingredient detail and shows drying periods required between applications.

When requesting a copy of this booklet, please use your company letterhead and state your title or connection. Address requests to Egyptain Lacquer Mfg. Co., Box 444, Newark 1, N. J. As new specifications are released, the company will make supplements available.

A Gel-Time Meter, designed to measure the time required for fluid thermosetting compositions to reach a point of rapid viscosity change during polymerization, is the subject of **Bulletin GEC-820,** released by General Electric, Schenectady 5, New York.

The bulletin shows pictures of the instruments, lists its features, and describes it and its main components such as torsion spring and actuating switch.

CHAIN-O-FLEX CONVEYOR



› CHAIN-O-FLEX CONVEYOR offers—in one simple system—a maximum of flexibility, safety and economy—Low installation cost and maintenance.

› All corners are quickly adjustable to any desired dip or angle.

› Easily assembled by any mechanic.

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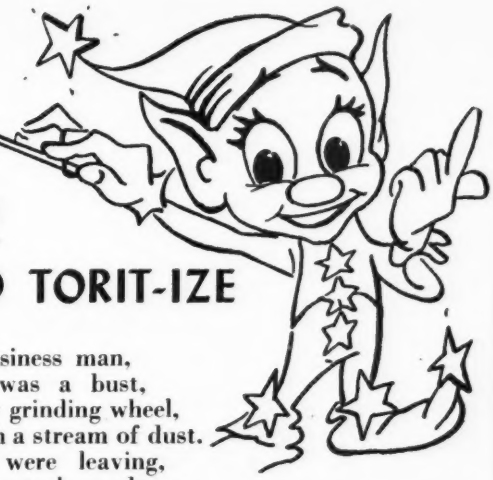

IT IS WISE TO TORIT-IZE

Once there was a business man,
Whose production was a bust,
Because from every grinding wheel,
There poured forth a stream of dust.
His employees were leaving,
His production took a drop,
Until he called the Torit man,
And said this thing must stop.
Soon grinders were protected,
With Torit Dust Collectors,
The air was clear as crystal,
And there were no more objectors.
Each finished piece was gleaming,
Each surface bright and clean,
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Could damage good machines.
This tale, it has a moral,
To follow if you're wise,
When dust becomes a problem,
It pays to Torit-ize.

P.S. If you want to know how Torit Dust Collectors can solve your dust problems, just drop us a line. Also ask for our latest catalog.

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"Corrosion Resistance of Copper and Copper Alloys." For 25 years The American Brass Company's technical staff has conducted continuous laboratory research and field study of the nature of corrosive attack on copper and copper alloys. The results of these studies have been published in a 24-page booklet, **Anaconda Publication B-36.** First of its type in the industry, this publication explains the chemical and physical nature of corrosive attack in its various forms. Included is a tabulation indicating the relative corrosion resistance of the principal types of copper and copper base alloys when in contact with 183 different corroding agents. Copies are available from The American Brass Co., Waterbury, 20, Connecticut.

Dust and Fume Removal Systems. A four-page illustrated folder has been prepared by Ohio Blow Pipe Co., 1725 Doan Ave., Cleveland 12, Ohio, which depicts and describes the three main functions of a dust collecting system: pick-up, conveying, and collection.

Illustrations show applications in connection with plating machines, buffing, grinding, and polishing machines, and other typical operations. Use of equipment such as cyclone and bag-type arrestors, long radius elbows, "Y" and other streamlined fittings and exhaust fans is illustrated and described.

"Just what is there about me that reminds you of one of your baking furnaces?"

"Surface Protection of the Cutlass" is the title of a four-page reprint available from the American Chemical Paint Co., Ambler, Pennsylvania.

The Cutlass, or F7U, is the Navy's latest jet fighter. The pamphlet tells of design and construction considerations of this 800 m.p.h. plane and the problems that are encountered at high velocities. Emphasis is placed on the finish of the plane, whose metals are first treated with Alodine prior to paint application. Details of the process, as applied at Chance Vought, on the finishing of the aluminum and Metalite airplane skin are given.

"Baker Guide to Successful Plating with Gold" is the title of a booklet issued by Baker & Co., Inc., 113 Astor St., Newark 5, N. J. This 12-page booklet briefly outlines the development of commercial gold plating salts and the equipment and precaution of work necessary.

Seven formulae for gold plating solutions are described in terms of ounces per gallon of necessary chemicals, preparation of the baths, operating temperatures and voltages, and types of anodes required. A conversion table and a temperature conversion chart are included for the convenience of the plater.

"Scrap for Steel Mills and Foundries for Defense" is the title of a 12-page booklet prepared to help increase the current dangerously low iron and steel scrap inventories in this country. Available from the National Production Authority, U. S. Department of Commerce, Washington 25, D. C., the booklet outlines the nature of the scrap shortage problem and the steps being taken to solve it.

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FOR WORK OF ANY SIZE

Whether removing burrs on huge castings or putting a fine finish on relatively small surfaces, National's "Model 400" will do the job better and faster. Has a 3/16" orbital stroke . . . operates at 5000 to 6000 rpm . . . weighs only 4 lbs. . . . costs $79.50. Reliable . . . powerful . . . will not stall. Write for full details today or see your dealer.

MODEL 400

Fast...Light...Powerful!

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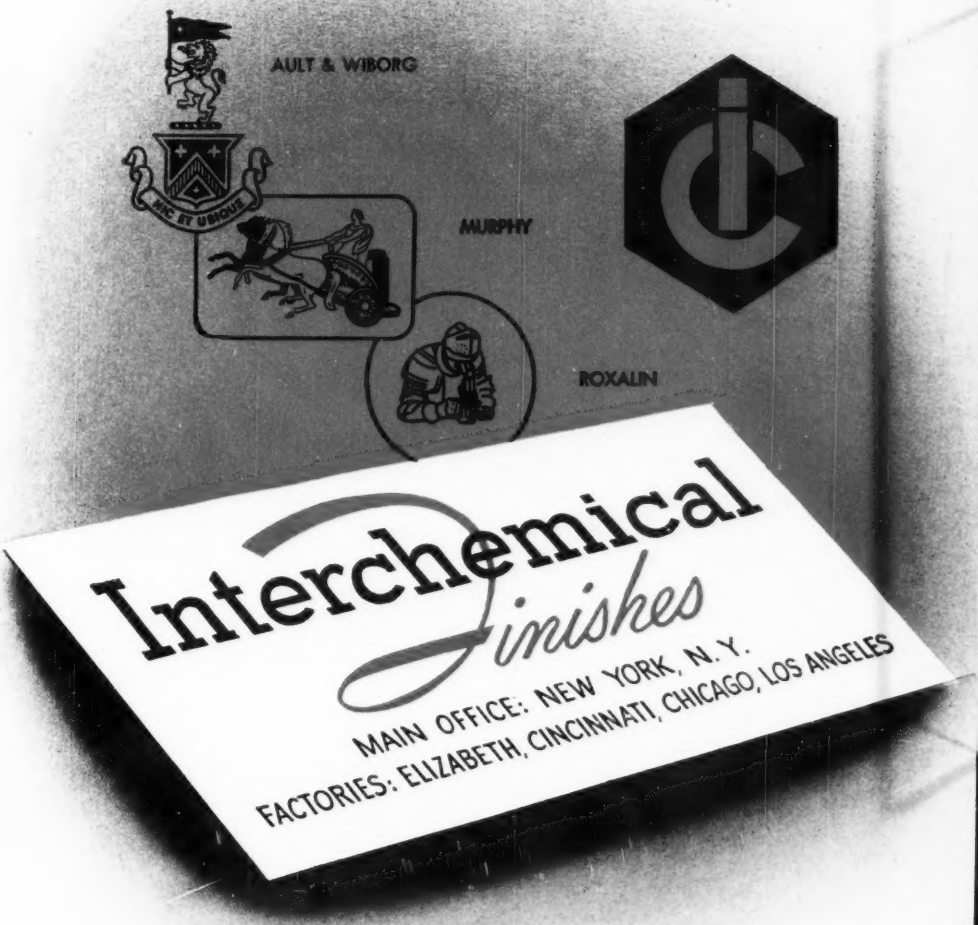

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